• JULY-AUGUST, 1961 •

AUG 24 1961

Prospects for the Sixties

A. S. King

Report on Meeting of Purchasing and Stores Committee

Fatal Accidents in the Electric Utility Industry in 1960

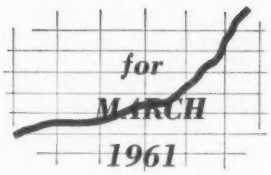
W. C. Bremner

Five EEI Committee Meetings

H. E. Cody, R. G. Meyerand
T. O. Thompson
A. J. Naquin, R. A. Lane

PUBLISHED BY EDISON ELECTRIC INSTITUTE

ELECTRIC UTILITY INDUSTRY Statistics IN THE UNITED STATES



Current Statistical Data Covering 100 Percent of Industry

(Includes Investor-Owned Companies, Cooperatives, and Government-Owned Utilities) — March, 1961

	Contiguous U. S. 1961	1960	%	Alaska and Hawaii, 1961
SOURCE AND DISPOSAL OF ENERGY				
NET GENERATION* (Kwhr in Thousands)				
By Fuel Burning Plants	50,765,088	51,011,963	— 0.5	
By Water Power Plants	13,875,503	13,289,082	+ 4.4	
Total Net Generation	**64,640,591**	**64,301,045**	**+ 0.5**	
Net Imports from Canada and Mexico	150,916	303,150	—50.2	
Purchases from Industrial Sources	202,873	291,688	—30.4	
Energy Used by Producer	26,902	805,245‡	—96.7	
Net Energy for Distribution	**64,967,478**	**64,090,638‡**	**+ 1.4**	
Energy Lost and Unaccounted for	6,626,774	6,522,586‡	+ 1.6	
Company Use and Free Service	163,350	201,476‡	—18.9	
Sales to Ultimate Customers	**58,177,354**	**57,366,576‡**	**+ 1.4**	
CLASSIFICATION OF SALES†				
NUMBER OF CUSTOMERS—As of March 31, 1961	**1961**	**1960‡**		
Residential	51,553,156	50,472,093	+ 2.1	175,034
Commercial or Industrial:				
Small Light and Power	6,722,265	6,675,025	+ 0.7	30,059
Large Light and Power	524,039	442,968	+18.3	1,047
Other Customers	195,368	202,489	— 3.5	983
Total Ultimate Customers	**58,994,828**	**57,792,575**	**+ 2.1**	**207,123**
ENERGY SALES—During month of March (Kwhr in Thousands)				
Residential	17,739,640	17,458,413	+ 1.6	69,652
Commercial or Industrial:				
Small Light and Power	10,274,765	8,806,124	+16.7	39,301
Large Light and Power	27,709,372	28,805,030	— 3.8	65,759
Street and Highway Lighting	568,857	513,548	+10.8	3,081
Other Public Authorities	1,345,244	1,272,332	+ 5.7	722
Railroads and Railways	417,955	467,767	—10.6	—
Interdepartmental	121,521**	43,362	+180.2	539
Total to Ultimate Customers	**58,177,354**	**57,366,576**	**+ 1.4**	**179,054**
Revenue from Ultimate Customers (Thousands)	**$981,032**	**$948,842**	**+ 3.4**	**$4,783**
RESIDENTIAL SERVICE				
AVERAGE CUSTOMER DATA—for 12 months ended March 31. (New Series)				
Kilowatt-hours per Customer	3,889	3,680	+ 5.7	
Average Annual Bill	$95.67	$91.63	+ 4.4	
Revenue per Kilowatt-hour	2.46¢	2.49¢	— 1.2	

* By courtesy of the Federal Power Commission.

† To conform with the new FPC "Uniform System of Accounts," the data reported as "Rural" have been assigned to other appropriate classifications.

‡ Revised to reflect estimates for non-reported data not previously included, and adjustments to earlier estimates.

July-August, 1961

EEI BULLETIN

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The EDISON ELECTRIC INSTITUTE BULLETIN is published monthly, except bi-monthly in July and August, by the Edison Electric Institute, an association of electric light and power companies in the United States and its territorial possessions. Its affiliate members consist of investor-owned electric utilities in North, Central and South America and contiguous islands in the Western Hemisphere.

The objectives of the Edison Electric Institute are:

The advancement in the public service of the art of producing, transmitting, and distributing electricity and the promotion of scientific research in such field.

The ascertainment and making available to the members and the public of factual information, data, and statistics relating to the electric industry.

To aid its operating company members to generate and sell electric energy at the lowest possible price commensurate with safe and adequate service, giving due regard to the interests of consumer, investor, and employee.

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CONVENTIONS and MEETINGS

1961

August

23-25 AIEE Pacific General Meeting, Salt Lake City, Utah

September

10-13 Rocky Mountain Electrical League Annual Fall Convention, Jackson Lake Lodge, Moran, Wyo.

11-12 EEI-AGA Accounting Division and Section Organization Meetings, Netherland Hilton Hotel, Cincinnati, Ohio

11-12 EEI Electric Space Heating and Air Conditioning Committee, Dearborn Inn, Detroit, Mich.

11-12 EEI Residential Promotion Committee, EEI Headquarters, New York City, N. Y.

13-15 EEI Farm Group, Belmont Plaza, New York City, N. Y.

14 Vermont Electrical Association Fall Outing, Lake Morey Inn, Fairlee, Vt.

14-15 EEI Commercial Cooking and Water Heating Committee, Pick-Carter Hotel, Cleveland, Ohio

14-15 ASME-AIEE Engineering Management Conference, Roosevelt Hotel, New York City, N. Y.

14-16 Public Utilities Association of the Virginias Annual Meeting, White Sulphur Springs, W. Va.

18-19 EEI Residential Electric Heating and Air Conditioning Committee, EEI Headquarters, New York City, N. Y.

19-20 EEI Street and Highway Lighting Committee, Hotel Statler, Buffalo, N. Y.

20-21 PIP 1961 Workshop Conference, Brown Palace Hotel, Denver, Colo.

20-22 IIFEUC Eighth Annual National Electric Farm Power Conference, Leamington Hotel, Minneapolis, Minn.

20-22 NELPA 5th Annual Meeting, Sheraton-Portland Hotel, Portland, Ore.

21-22 Missouri Valley Electrical Association Accounting Conference, Sheraton-Jefferson Hotel, St. Louis, Mo.

24-27 ASME-AIEE National Power Conference, Sir Francis Drake Hotel, San Francisco, Calif.

25-26 PEA Accident Prevention Committee, Philadelphia, Pa.

25-27 EEI Industrial Relations Committee 14th Annual Round Table Conference, Drake Hotel, Chicago, Ill.

25-27 EEI Meter and Service Committee, Leland Hotel, Springfield, Ill.

27-28 PEA Annual Meeting, Bellevue Stratford Hotel, Philadelphia, Pa.

27-29 EEI Industrial Power and Heating Group, Kenmore Hotel, Boston, Mass.

27-29 Missouri Valley Electrical Association Sales, Rural and Home Service Conference, President Hotel, Kansas City, Mo.

28-29 Southeastern Electric Exchange Accounting Section Conference, Atlanta Biltmore Hotel, Atlanta, Ga.

October

1- 7 Electric Council of New England Management Training Course, Bald Peak Colony Club, Melvin Village, N. H.

2- 3 Electric Council of New England Residential Sales Workshop, Hotel Wentworth-by-the-Sea, Portsmouth, N. H.

2- 3 Iowa Utilities Management Conference, Ft. Des Moines Hotel, Des Moines, Iowa

2- 4 EEI Prime Movers Committee, Continental-Denver Hotel, Denver, Colo.

4- 6 Indiana Electric Association, 52nd Annual Convention, Sheraton Hotel, French Lick, Ind.

12-13 EEI Transmission and Distribution Committee, Ft. Des Moines Hotel, Des Moines, Iowa

15-20 AIEE Fall General Meeting, Detroit, Mich.

15-20 National Safety Congress, Chicago, Ill.

16-18 NELPA Business Development Section Joint Meeting with Rate Research Committee and Public Relations and Advertising Committee, Davenport Hotel, Spokane, Wash.

18-19 Wisconsin Utilities Association Electric, Gas Operating and Sales Sections' Convention, Schroeder Hotel, Milwaukee, Wis.

18-20 Electric Council of New England 5th Annual Conference, Hotel Somerset, Boston, Mass.

23-24 EEI Electrical Systems and Equipment Committee, The Jack-Tar Hotel, San Francisco, Calif.

26-27 Southeastern Electric Exchange Engineering and Operation Section Conference, Buena Vista Hotel, Biloxi, Miss. (Closed Session).

26-27 PCEA Hawaiian Conference, Princess Kaiulaui Hotel, Honolulu, Hawaii

30-Nov. 1 EEI Insurance Committee, Tides Hotel, St. Petersburg, Fla.

November

6- 8 EEI Accident Prevention Committee, Tutwiler Hotel, Birmingham, Ala.

9-11 PIP—1961 National Youth Conference on the Atom, The Palmer House, Chicago, Ill.

12-15 Air Conditioning and Refrigeration Institute Annual Meeting, The Homestead, Hot Springs, Va.

13-17 NEMA Annual Meeting, Traymore Hotel, Atlantic City, N. J.

14-15 EEI Eighth Annual Area Development Workshop, DuPont Plaza Hotel, Miami, Fla.

15-17 Southeastern Electric Exchange Sales Advertising and Public Relations Conference, Tides Hotel, St. Petersburg, Fla.

26-Dec. 1 ASME Winter Annual Meeting, Statler Hilton Hotel, New York City, N. Y.

27-28 PCEA Administration Services Section, Hotel Miramar, Santa Barbara, Calif.

Prospects for the Sixties

By A. S. King
President, Northern States Power Co.

THERE is a strong community of interest between the electric utilities and the coal industry in this country, and all evidence points toward an intensifying of this interest in the next decade or two.

In 1933 the electric utilities consumed only 8.5 percent of the total consumption of coal in the country, and this percentage steadily increased until last year the electric utilities consumed over 45 percent of the total consumption of coal. This consistent increase in use of coal by utilities occurred while the efficiency of power production was increasing in a marked degree, and in spite of the increase in availability of natural gas for power production at very low rates.

In 1933 the over-all average use of coal per kilowatt-hour was 1.47 lb., while in 1959 this had dropped to an average of .891 lb. per kilowatt-hour. In this same period, while the use of coal had increased almost six times, the use of natural gas for power production increased over 15 times. So in spite of these two unfavorable factors regarding the use of coal, it can be said that thermal power production has been very intimately associated with the coal industry, and there is every evidence that the electric utility energy requirements in the next decade or two will provide an ever-increasing market for coal.

The coal industry should be complimented on its farsighted efforts to improve mining techniques through mechanization, which has resulted in lower unit costs. This has had a great deal to do with the increased reliance of electric utilities on solid fuels. We realize that these new methods, with their high capital costs, require stable, long-term markets in order to pay out. The electric utilities supply such a market, and the expansion projections in the utility field will greatly expand this market.

There have been a number of projections made of the increasing output of electricity in the next 10 and 20 years. These projections have been made by quite different sources, but they all point to a doubling of the output in the next 10 years, and a quadrupling of the output in the next 20 years.

Early in 1960, the Institute prepared an estimate of the future growth of the electric industry. This was prepared from data obtained from all the utilities in the country developed on a regional basis, and the results were then totaled. These results were confirmed by another study by members of the EEI staff on the basis of correlations with the national economy on a country-wide basis.

Manufacturers' Projections

Both the General Electric Co. and the Westinghouse Electric Corp. also made projections of the use of electricity in the next decade. Their methods were quite different from those used by EEI. They developed the use by various classes of customers, having in mind the increase in population and the various new devices that would be developed in the 10-year period ahead. They also analyzed the industrial market and the effect on energy consumption as a result of increased automation. They, too, developed the fact that the use of electricity would double in the next 10 years.

Curves of the past performances, of themselves, are not always indicative of what the future may be. On the other hand, they can present a very good weight of evidence to confirm estimates. The electric consumption in 1959 was about 2½ times the consumption in 1949, nearly six times the consumption in 1939, and about 8½ times the consumption in 1929. So, in spite of a major depression and a world war intervening, the history of the electric industry is one of doubling its output each decade. All of us in the electric utility business are confident that this record will continue in the foreseeable future.

In 1959 the output of the investor-owned electric utilities was 578 billion kwhr. By 1970 this is expected to reach 1.208 trillion kwhr. To many people those figures seem too big to be believed and one wonders whether they are merely hopes and not real projec-

An address before the Convention of the National Coal Association, Washington, D. C., June 7, 1961.

tions. On the other hand, we can already see the means of making these estimates come true.

The domestic market has always been the stable bread and butter part of our business. We are all aware of the tremendous increase in number of appliances in use in the home. As a matter of fact, 1½ new uses for electricity in the home have been introduced each year for the past 25 years. We cannot predict what specific new uses will be developed in the next 10 years, but we are confident as many as 15 new uses will appear.

My own company operates in an area where the summer weather may be extremely hot for only a brief period. In spite of this, an active market in home air conditioners has developed. All of our stores and offices are now air conditioned, and this has led to a demand for home air conditioning.

Increased Interest in Air Conditioning

Evidence of this increasing interest in home air conditioning is the fact that in our company we had a peak load last summer that exceeded our previous winter peak. We would expect the same condition this year, and will perhaps be experiencing a summer peak load inside of five years, unless we can greatly stimulate the present interest in electric home heating.

Electric home heating and the all-electric home have become a rapidly growing business. The all-electric home uses seven times the average home consumption in our operating territory. We are just getting into this business, but we are amazed at the tremendous interest on the part of our customers.

Automation in industry is moving ahead, and this greatly increases the use of electricity. These new things, plus the expected increases in population, seem to assure the realization of our goal—to double the output in the next 10 years.

It must be recognized, of course, that not all of this expansion will be in fuel-burning plants and that there will be other than solid fuels used for some portion of this expansion. According to the best estimates available, the division of power production facilities between the various sources in 1959 and 1970 will be as follows:

	1959		1970	
Steam	111.8	Million Kw	225.4	Million Kw
Hydro	12.5	" "	20.3	" "
Nuclear	0.065	" "	7.7	" "
*Other	3.00	" "	9.8	" "
Total	127.3	" "	263.2	" "

*Other includes capability from other than investor-owned systems and non-utility sources.

From this, it is evident that in spite of the growth in hydro, and the installation of nuclear power production, the installation of new fuel-burning steam power capacity will more than double in the next 10 years.

It is anyone's guess how much of an increase to assign to natural gas and oil. I have a rather firm conviction that the use of gas for power production will be declining 10 years from now, provided the coal-mining interests continue the progress already made in automation and lower unit cost. Assuming no substantial increase in the use of gas and oil for generation, and allowing for generation by hydro and nuclear power sources, I would estimate that our 1970 requirements of coal would be a minimum of 300 million tons, or an increase of about 125 million tons over our 1960 requirements. This also allows for increasing efficiency of generation. In 1960 the electric utilities burned over 176 million tons of coal, and although there will be other forms of energy used and efficiencies will increase, it is reasonable to expect our industry's coal requirements to exceed 300 million tons by 1970.

This presents a real challenge for the coal industry. It is a goal that can be achieved by the industry if the price position can be maintained. To maintain a favorable price position, the industry must continue the process of automation to compensate for the inevitable rise in labor and other costs.

In 1960 the electric utilities accounted for 45 percent of the total consumption of coal in this country. By 1970 we would expect the utilities to account for about 60 percent of the total consumption of coal. This means that the utilities are fast becoming the coal industry's prime market.

Recently much attention has been given to the research developments in certain new processes for the generation of electricity, and these are:

- Magnetohydrodynamics.
- Thermoelectric processes.
- Thermionic processes.
- Fuel cells.

Magnetohydrodynamics is only possible or feasible on a very large scale, and would undoubtedly become part of the utility complex. This in itself would not affect the demand for coal.

The thermoelectric, thermionic devices, and the fuel cell would seem to present a future hazard to central station energy sales. These methods are still only laboratory advances, and it may be years before they become practical for the home. Even then I doubt their universal adoption. The cost of electricity per unit is so low that there is little incentive for the home owner to become his own electric plant operator. While predictions of the future must be handled with extreme caution, I personally doubt that we will live to see a fuel cell substituting for our central station service.

Solar and Nuclear Energy

Attention has also been given to two other energy sources—solar energy and nuclear energy. Both of these have the ultimate potential of becoming direct competitors with coal, oil, and gas.

Although it is reassuring to know that solar energy is a tremendous, almost never-ending source of energy, studies to date seem definitely to indicate that it will have only fringe applications in this country.

Nuclear energy should have a more immediate application in high-cost fuel areas. However, this source is not expected to provide more than 7 or 8 percent of the total energy required for electric generation by

1970, and current long-range estimates indicate probably 20 percent by the year 2000. However, the very rapid growth in the demand for electricity would seem to permit some expansion in these areas without seriously affecting the use of coal.

The coal industry has always been a stronghold of free enterprise. Our utility industry has also been not only a strong advocate, but the end result of the application of free enterprise.

In the last 10 years the new plant investment of the electric utilities amounted to over $30 billion. Only about 45 percent of the cost of this growth could be realized through internal sources, and the remainder had to be obtained through the sale of securities. The American public has gladly and voluntarily invested these large sums in our business. In 1959 the electric utilities paid over $2 billion in taxes. In spite of these two facts there are people in our government who are promoting an increase of government ownership of the power business. We do not need government funds. The people will invest them voluntarily. The government could find a better and more logical use for its dollars—and it is foolish to throw away $2 billion of tax revenue. Yet we witness a surge in this direction in many high places.

We believe that we are only the first industry in line for an all-out attack. If we should fall, is any American industry safe from government competition and ultimate nationalization? We sincerely hope that we will continue to have the friendship and help of the coal industry in our fight for existence against government encroachment that we see ahead. According to the Bureau of the Budget, our government is already in 19,265 businesses, including 506 manufacturing agencies. With such a big head start it makes our work even more difficult.

For many years the electric utility companies have been in the business of converting raw energy into the very practical and useable form of electricity, and of distributing this versatile form of energy to the ultimate user. Through the years the efficiency of this process of conversion and distribution has been very greatly increased. But we do not manufacture energy, nor do we extract it in its initial forms from the earth. That is the job for the people in the coal industry. They supply us the raw source of energy and we convert it to more useable form and distribute it. So in effect we are partners in this most necessary process of supplying industry and the home with a useable form of energy. This partnership should in reality go beyond the bargaining stage and should reflect in other areas of our own and mutual problems.

We in the utility industry recognize the mutual inter-relation of our business with the coal industry. We have been greatly encouraged by the competitive position that the coal industry has assumed in recent years, and we anticipate a continuation of its efforts to meet competition on unit cost in order to realize its full future potential.

Policy Change Announced by Inter-Industry Council

REPRESENTATIVES of electric companies and rural electric cooperatives on the board of the Inter-Industry Farm Electric Utilization Council plan to undertake more responsibility for the leadership and direction of the inter-industry program, it was announced recently after a meeting in Washington, D. C., between council directors and top officials of the Rural Electrification Administration.

This move reflects the growing strength of the state inter-industry groups, and the cooperation between investor-owned electric utility companies and rural electric cooperatives throughout the nation in rural power-use programs.

A. N. Prentice, Vice President and General Manager, Ohio Power Co., has been named Co-Chairman of the council, along with J. E. Nicholson, Manager of the Jefferson Electric Cooperative, Inc., Brookville, Pa.

REA Administrator N. M. Clapp said that the REA will continue to support the Inter-Industry Farm Electric Utilization Council in the interest of rural electric cooperatives participating in the national council and affiliated state farm electrification groups. R. A. Dell, Deputy Administrator of REA, will serve as liaison with the council.

Messrs. Prentice and Nicholson will serve as co-chairmen until the council's 1961 annual meeting in Minneapolis, Minn., Sept. 20-22.

California Oregon Power Merges with Pacific P&L

THE California Oregon Power Co. has merged with the Pacific Power & Light Co.

Announcement that California Oregon Power had formally become a part of Pacific Power & Light, the surviving company, was made jointly at Portland and Medford by P. B. McKee, Chairman of the PP&L Board, and A. S. Cummins, COP President, who, with G. L. Jackson, Vice President of COP, becomes a Vice Chairman of the Board of the enlarged utility.

Messrs. McKee and Cummins hailed completion of the merger as "a forward step that will integrate the full resources of the systems and greatly strengthen their ability to meet increasing public service responsibilities."

325,000-Kw Atomic Plant to Be Built by Pacific G&E

1965 Target Date Set for Project; Expected to Be Competitive with Area's Conventional Steam Plants

AN atomic power plant which will have a generating capacity of 325,000 kilowatts—one of the largest in the world—and which is expected to be economically competitive with electricity generated in a conventional steam plant, is scheduled for completion late in 1965 by Pacific Gas and Electric Co.

The plant will be built at Bodega Bay on the Sonoma County Coast, 50 miles north of San Francisco.

Plans for the project, to be called Bodega Bay Atomic Park, were announced by PG&E President N. R. Sutherland. He said applications to the U. S. Atomic Energy Commission and the California Public Utilities Commission for permission to build the plant would be made as soon as possible. The Bodega Bay atomic installation, powered by a boiling water reactor, will have an electric generating capacity capable of serving a city of half a million population.

PG&E estimates the installation will cost $61 million and will produce electricity for slightly less than 6 mills per kilowatt-hour.

PG&E believes electricity produced at Bodega Bay with nuclear fuel will be economically competitive with electricity that could be generated in a conventional steam plant (gas and oil fueled) at that location. The Bodega site was selected because PG&E's load growth requires a large generating station in that region in 1966.

Mr. Sutherland pointed out that no economically competitive atomic power plant is operating in the U. S., but PG&E's 60,000-kw Humboldt Bay nuclear unit under construction near Eureka, Calif., is expected to produce electricity competitive in that area. Humboldt Bay will be completed in 1962.

"PG&E's atomic power development program, begun in 1951, always has had large economic plants as its prime objective," Mr. Sutherland said. "The atom will achieve its important role in energy production when it produces electricity to serve a large and diversified power market as economically and as reliably as available conventional fuels.

"We are convinced that atomic energy can do this at Bodega Bay, taking its place as an economic source of energy alongside natural gas, oil, falling water, and geothermal steam to serve central and northern California.

"PG&E now has committed the investment of almost $100 million to atomic power, the better to serve residents of this region in coming decades. It already has paid handsome dividends in engineering improvements that are hastening economic atomic power everywhere.

"As with all our atomic projects, we will build Bodega Bay with our own money. There will be no government subsidy or financial contribution from any other source."

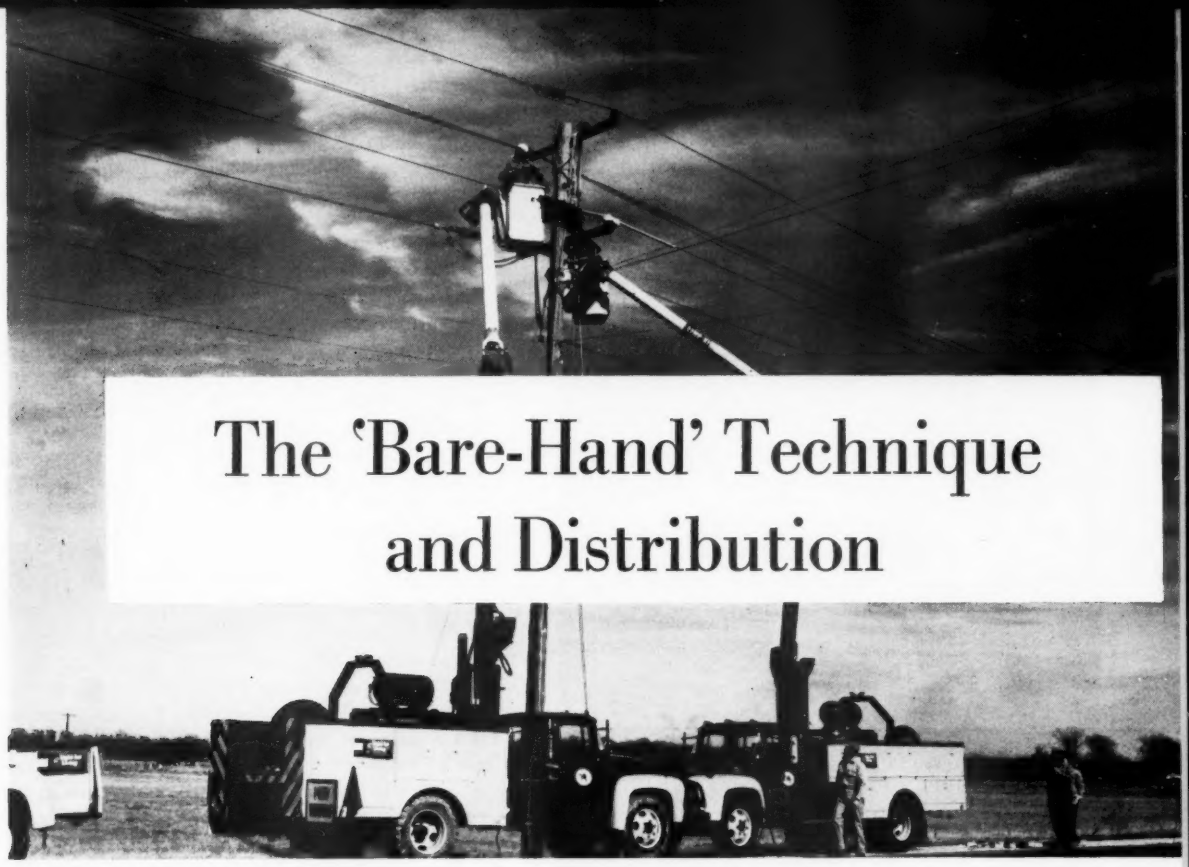
Bodega Bay Atomic Park will be built on a 225-acre site at the south end of Bodega Head, the narrow peninsula that separates Bodega Harbor from the Pacific Ocean.

75 Tons of Uranium for Fuel

The Bodega plant will be fueled by approximately 75 tons of uranium, equivalent to more than 3 million tons of coal, which is expected to run the plant for 3½ years. Fabrication of the first load of fuel, called the reactor core, will cost an additional $8½ million.

Like PG&E's Humboldt plant, Bodega Bay will utilize pressure suppression containment, developed by PG&E, which allows the reactor to be installed below the ground. The reactor and containment system will be enclosed in a concrete and steel structure built below ground to a depth of about 100 feet. Sea water evaporators pioneered by PG&E at its Morro Bay power plant will provide the Bodega plant with fresh water for the reactor and steam system and auxiliary uses.

If necessary licenses and permits are obtained on schedule, PG&E will start work at Bodega Bay in August, 1962. An estimated 300 men will be at work on the project at the peak of construction. PG&E will function as its own engineer and construction manager.



The 'Bare-Hand' Technique and Distribution

By C. C. Crockett
Transportation Superintendent,
Louisiana Power & Light Co.

NOT enough caution has been sounded against the application of the "bare-hand" technique (working on energized conductors from insulated aerial baskets) on distribution circuits.

Essentially, the technique involves placing a conductive pad in the bottom of the basket and connecting this pad to the energized conductor on which the lineman intends to work by means of a flexible conductor and clamp. The lineman is, therefore, energized constantly at the potential of the conductor and may handle it at will without encountering the harmless but annoying "shocks" associated with the capacitance charging effect each time he touches the conductor.

Started Seven Years Ago

About seven years ago, Louisiana Power & Light Co. first began to do hot-line work on 14.4-kv circuits from aerial basket devices with rubber gloves. Rubber gloves were used then and are used now to eliminate these capacitance charging "shocks" because we believe that this is the safest way to do hot-line work on distribution circuits from insulated aerial baskets.

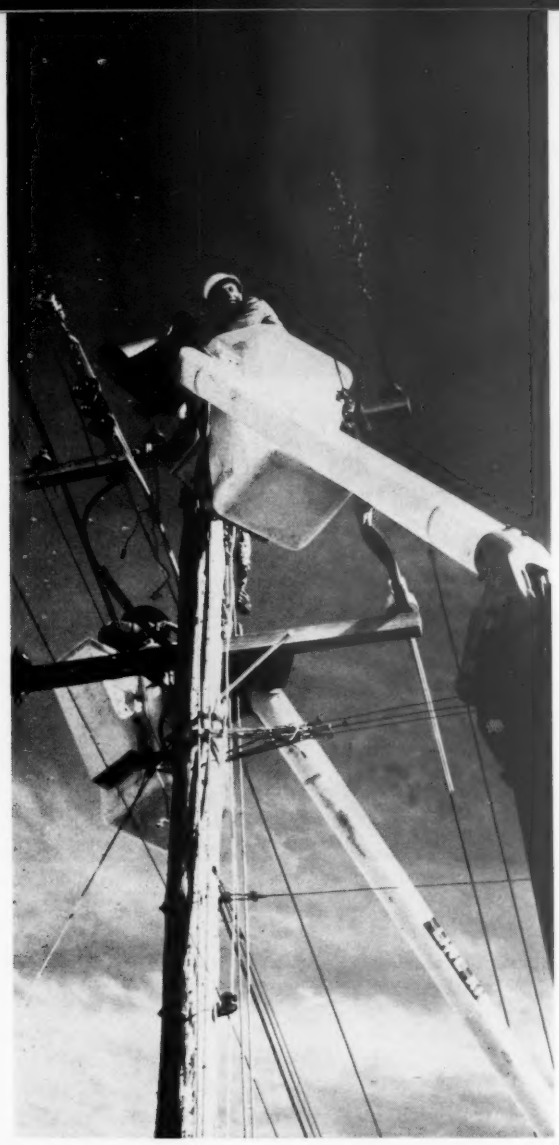
In using aerial basket devices, there are two basic insulation requirements insofar as work on distribution circuits is concerned, while there is only *one* in connection with work on transmission circuits.

In working on distribution circuits (34.5 kv and below) hot, we are concerned with, first of all, protecting the man in the basket from electrocution and, second, protecting the workmen and general public on the ground from electrocution by coming in contact with a "hot truck."

Object: Insulated Outer Boom Assembly

When we first began to use aerial basket devices for hot-line work, we knew that this latter consideration would be more than solved if we could get manufacturers to develop a "completely insulated outer boom assembly." This concept was described and promoted on many occasions from 1953 onward with all of the principal manufacturers of aerial basket devices with varying degrees of success.

Some merely wrapped the metal outer boom with insulating material, which was not entirely satisfactory, but did give a certain measure of protection to the people on the ground. Others "inserted" an insulat-



Louisiana Power & Light Co. lineman works on energized high-voltage wire from an aerial basket. The company started using these devices about seven years ago. Although this is called the "bare-hand" technique, Louisiana P&L linemen use rubber gloves which eliminate the capacitance charging "shocks."

ing section in their metal outer booms and in the metal leveling cables. All of these attempts by various manufacturers were well intended but did not achieve an adequately insulated device.

Finally, in May, 1958, one manufacturer exhibited the very first unit in which the outer boom itself was made of an insulating material—a spun fiberglass tube. This was quite an achievement in the development of adequately insulated aerial basket devices for work on or near energized conductors. This, together with long glass insulators in the self-leveling cables and the use of nonconducting hoses for oil and air lines, produced a practically "insulated outer boom assembly." We say "practically" for in this case we could not classify the unit as having a "completely insulated outer boom assembly" since we still had metal cable riding over the sheave wheels at each end of the boom. Under the most extreme positions, however, there was a minimum of six feet of fiberglass rod insulating the top of the boom from the bottom of the boom at the elbow joint. Since fiberglass, clean and dry, has an insulating value of about 100 kv per foot, it is readily seen that the minimum insulation from basket to ground by way of the boom, even when the insulation value was de-rated by 50 percent for the insulators being damp and dirty, was in the order of 300 kv. Since our standard transmission voltage up to then had been 120 kv, or 69 kv phase to ground, we knew that not only had we solved this part of the problem for distribution work, but had also solved the insulation problem for transmission hot line work.

A Bigger Problem

The *bigger* problem of protecting the man in the basket when working on distribution circuits had yet to be solved. Obviously, when a man in a basket is working on distribution voltages, which are generally installed on eight-foot or nine-foot crossarms, he has the hazard of accidentally coming into contact with phase wires or ground wires other than the one on which he is working at the moment. This hazard is not present when working transmission voltages because of the much greater physical separation of conductors and, consequently, a well-insulated basket here is of no importance. On distribution work, however, the man's very life often depends on the insulation *through* the side wall or bottom of the basket in which he is standing.

Picture a lineman in a basket working on one phase of a three-phase, four-wire, 24-kv feeder. The voltage of this phase to ground is about 14 kv. Also picture a grounded neutral wire against the side or bottom of the basket with the lineman's leg or foot directly opposite this ground wire, and you can readily see how important the basket insulation becomes when we talk about working distribution voltages hot. To the man in this basket, that 300 kv of insulation from basket to ground by way of the boom is relatively unimportant—the insulation that protects *his* life is the insulation of the basket itself.

These hazards in doing distribution hot-line work were recognized, and we require all phase wires and grounded neutral wires within reach of the working position (other than the wire being worked on) to be covered with rubber line hoses, blankets, hoods, etc.

For seven years, we have insisted that our baskets be tested at 45 kv for 30 seconds every two weeks, or at any time upon the request of the lineman. Recently, we were successful in promoting the development of dense polyethylene basket liners for our baskets, and have increased this test for the liners to 50 kv for one minute. We still make routine dielectric tests every two weeks, and will continue to do so until experience shows that it will be absolutely safe to lengthen this test period. The liners are quite an improvement over

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Community Leadership Urged at Purchasing and Stores Meeting

Three of the speakers at the EEI Purchasing and Stores Committee Meeting in Houston are, from left: G. A. Remalia, Duquesne Light Co.; C. J. Magnesen, Commonwealth Edison Co., and W. H. Brueggemann, Wisconsin Electric Power Co. About 300 attended the meeting.

AT the 14th Annual Meeting of the EEI Purchasing and Stores Committee in Houston, Texas, May 15-17, the following important subjects were stressed:

- Community leadership.
- Cooperation among Purchasing, Stores, and Sales departments.
- Utilization of local vendors' stocks.
- Library and source-of-supply files.
- Practical material requirement forecasting—interdepartmental coordination.
- Inspections—new and used materials and the disposal of dormant items.
- Purchasing performance evaluation.
- Reviewing Purchasing practices.

300 Attend Meeting

The three-day meeting was attended by some 300 representatives of investor-owned electric utilities, their guests, and manufacturing personnel. E. J. Martin, New Orleans Public Service, Inc., who at the time of the meeting was Vice Chairman, Stores, of the Purchasing and Stores Committee, and who has subsequently become committee Chairman, presided at two of the sessions. Presiding at the other sessions was A. H. Hamilton, Northern States Power Co., Vice Chairman, Purchasing, of the committee. The late R. B. Gear, Commonwealth Edison Co., Purchasing and Stores Committee Chairman for the 1960-61 administrative year, was in charge of the business meeting.

T. H. Wharton, President, Houston Lighting & Power Co., welcomed the committee, and Mr. Gear delivered the opening remarks.

As the luncheon speaker on the first day of the meeting, Marvin Hurley, Executive Vice President, Houston Chamber of Commerce, pointed out five specific ways to help provide leadership, founded on the political virtues of courage, honor, integrity, and devotion to our country. They were:

- Understand our system of government, of free enterprise; how our system was created, how it works, its benefits, and its enemies.
- Belong to the political party of our choice, supporting it with some of our time, talents, and means; fight—beginning at the precinct level—for its adoption of sound principles and its nomination of qualified candidates for public office.
- Register as a voter, inform ourselves on the issues and personalities of campaigns, and vote our informed convictions at every election.
- Watch the performance of public officials by maintaining contact with them as they represent us in government, and have the intestinal fortitude to oppose unsound action by government, even though such action might be personally beneficial to us.
- By doing this, and by encouraging others to take these steps, we can help to make our system work so well that the most uninformed of our people will be unwilling to chase the will-of-the-wisp of other systems that have already been tried and found wanting.

H. F. Staacke, Vice President, Houston Lighting & Power Co., called for cooperation among Purchasing, Stores, and Sales departments. He said purchasing people can be of particular help to sales people by including in their bid invitations those organizations that make extensive use of electric service. He was the luncheon speaker on the second day of the meeting.

"We do not think you should be called upon to pay exorbitant prices, to accept unreasonable deliveries, or to tolerate substandard products from suppliers, even

though they may be customers," Mr. Staacke said. "Nevertheless, these people do purchase power from us; they offer employment to our local citizens who are, in turn, our customers; they give business to other industries who use our service; and it may be that they also bring substantial revenues to our local areas from other regions as well. If, after the matters of quality, price, delivery, or other factors are considered, a balance is approached, we feel that you should evaluate the collateral advantages our customers offer, and that these customers be given every consideration."

R. F. Connolly, Tampa Electric Co., explained how his company, through utilization of local vendors stocks, had reduced supplies inventory of $2,190,000 in 1956 to $960,000 this year, while electric customers in the same period increased from 122,000 to 156,000.

In Florida, Mr. Connolly explained, there is a sales tax law which reads: "Each purchase order shall carry up to the maximum of $1000 tax." This was an amendment to a sales tax law which formerly made the $1000 maximum applicable to each supplier rather than each order, and promised to increase the company's sales tax by $85,000 per year.

"We were then faced with either paying the additional tax or placing blanket orders with our local vendors for a six months period covering specified items and quantities to be released as required," Mr. Connolly said.

It was agreed that local vendors who received orders would proceed to put 120 days' usage in stock, and when this amount was reduced to 60 days' usage, they would then put the 60-day balance in their stock.

"In purchasing on blanket orders," Mr. Connolly said, "the State of Florida allows you to cancel any items on these orders due to defective materials, safety hazards, or failure of the vendor to have the items in stock prior to expiration of the order, and there are no other exceptions. If you over-order, you must pay the tax on the outstanding balances you receive during any subsequent six months, so . . . it is economically advantageous to figure your requirements as closely as possible."

Purchase Orders Reduced

In addition to reduction of inventory and the savings in sales tax, the company has cut down its number of purchase orders by 25 percent, Mr. Connolly told the meeting. "In issuing blanket orders, we are given a better price for standard items that figured on an over-all basis we save an amount equal to 7½ percent of the total purchases," he said. Mr. Connolly pointed out that such purchases in 1960 amounted to $3,250,000, and 7½ percent represented a saving of some quarter of a million dollars.

The development and maintenance of purchasing department library systems were discussed by D. E. Nesbit, Duquesne Light Co.

Mr. Nesbit said that to be effective a library must be simple. In essence, it consists of three basic elements: a vendor name file, a commodity file, and the publications themselves, i.e., catalogues, manuals, handbooks, technical references, directories, specifications, standards, etc.

Discussing the Duquesne library system, Mr. Nesbit said that because it was simple and easy to use, it had enabled Purchasing and other departments in the company to get maximum use from more than 4000 publications it has on file.

There is no one system for developing and maintaining a library which is ideal for all purchasing departments, he added, as much depends on the size of the organization and the type of operations in which it is engaged.

'Keep It Simple'

"The best rule of thumb is to keep the library as simple as possible. A well-run library is an additional tool Purchasing can use to make buying more efficient and more of a science," he told the meeting.

"Practical Material Requirement Forecasting" was the title of a paper presented by G. A. Remalia, also of Duquesne Light. He was concerned primarily with inter-departmental coordination.

Mr. Remalia cited a survey of reports from 43 companies which show where Purchasing and Stores departments place emphasis in connection with practical material requirement forecasting. These areas (in order of frequency) were referred to in the survey:

- Advance notice via engineering bills of material in conjunction with construction schedules.
- Advance notice via users forecasts or estimates; these may be submitted monthly, quarterly, semiannually, or for longer periods.
- Budget reviews detailing various projects.
- Purchasing advice to users as to lead time, price situations, and availability of materials.
- Avoiding stock accounts for large quantity requirements usually in connection with major projects.
- Regularly scheduled meetings of Purchasing, Stores, and Engineering or using departments.
- Stock status reports to users who in turn advise of stock augmentation.
- Efficiencies produced via electronic data processing which include programming of unusual requirements into the reports.
- The use of open-end blanket orders.
- Development of area warehousing and reliability of vendors.
- Established material standards and related material listings.
- Dependence upon those requesting new items for original forecast of use.

"Inspection—New and Used Material and Disposal of Dormant Items," was the title of a paper presented by W. S. Marks, Commonwealth Edison Co. To obtain material for a study on this subject, the Purchasing and Stores Committee queried 89 companies and received replies from 84, or 94 percent.

Here are some of the findings:

- Twenty-one percent of the companies consider it necessary to have full-time inspectors. Mainly, these are the larger utilities that probably have more spe-

A. H. Hamilton, third from right, Northern States Power Co., and Vice Chairman, Purchasing, EEI Purchasing and Stores Committee, at the EEI Purchasing and Stores Committee Meeting in Houston, talks informally with other industry P&S men. From left are: W. Y. Cottom, West Penn Power Co.; R. H. McNeal, The Cleveland Electric Illuminating Co.; A. E. Stant, Potomac Electric Power Co.; Mr. Hamilton; G. H. Cole, Alabama Power Co., and D. J. Fitzgerald, Baltimore Gas and Electric Co.

cial items not fully covered by standard specifications.

• Sixty percent of the companies make detailed inspection of materials either purchased to their own specifications or on other selected items; these inspections are made in some instances at manufacturing plants, and in other cases upon receipt. Thirty percent of the utilities specify on purchase orders that material is to be inspected.

• Ninety-four percent of the utilities thoroughly inspect all wood products (poles, crossarms, lumber, wood ladders) to insure receiving an acceptable product for reasons of safety and durability.

• Ninety percent of the companies inspect all material when received.

• Fifty percent of the companies use the "sampling method" for inspections and report this procedure is satisfactory. Another 46 percent indicated that they do not use this method.

• Almost 70 percent of the utilities inspect distribution transformers, either to a minor extent or make extensive electrical and laboratory tests.

• Sixty percent of the utilities concluded that the cost of making inspections is economically justifiable; 18 percent of the companies believe it justified to make inspections occasionally. Sixteen percent stated inspection costs cannot be justified. Thirty percent of the utilities consider it worthwhile to make inspections at vendors' plants, with another 26 percent stating that it should be done on an occasional or limited basis. Forty percent indicated that it is not worthwhile for the companies to inspect at suppliers' plants. The preponderance of opinion is that it is worthwhile to inspect materials upon receipt; 75 percent of the respondents replied affirmatively to this question, 9 percent concurred, but on a limited basis, and another 9 percent did not consider it worthwhile.

• All of the utilities reporting inspect materials removed from service to determine their condition for reuse, or recommended disposition as saleable or junking.

Measuring Purchasing Performance

G. T. Cole, Alabama Power Co., told the meeting that it was possible to measure purchasing performance.

Alabama Power, Mr. Cole said, has approached the subject through breaking down of the Purchasing function and related materials management into various phases, with the two-fold purpose of stimulating the company's own Purchasing personnel and to educate management as to the opportunities in this field. Here are some of those phases:

• Organization—A well-trained organization of specialists, knowing sources of supply, and their resources are certainly worth money.

• Records—Is your department streamlined as to paper work, with expensive formal order issuance held to a reasonable minimum, and do you regularly discard records not necessarily maintained, and at the

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Purchasing Practices Reviewed

By R. H. McNeal
General Supervisor, Electric Buying,
The Cleveland Electric Illuminating Co.

THE two areas which I will consider here are:

- Purchasing practices to streamline procedures and reduce the number of purchase orders, with the inclusion of the small order problem and the use of local orders.
- Effective administrative control.

In reviewing ordering procedures, the Purchasing and Stores Committee found that practices by this group, as a whole, have not changed recently to any great extent. As far back as 1953, in a presentation before this group, M. B. Covell of St. Louis commented on the various procedures then being used to reduce and streamline operations. Even at that time, many of the procedures had been in use for many years.

Believing ordering procedures are often influenced by requisitioning patterns of others, our first look was in this area. Today's answers to a questionnaire disclose that the average requisition for stock material covers requirements for three months or less. This is true for 94 percent of the responding companies. A breakdown of the count shows 25 percent covering one month's requirements, 25 percent two months' requirements, and 44 percent three months' requirements. In over 60 percent of the cases the requisition calls for a single shipment. Probably as a result of such a requisitioning pattern, over 85 percent of the companies commit the entire requirement to vendors at one time.

In addition, 85 percent of the companies are requisitioning like items at the same time, but only 30 percent are doing this on any kind of a predetermined requisitioning schedule. In other words, the majority of the companies are requisitioning on an as-needed basis. The committee reiterates that it might be worthwhile to investigate the economics of:

- Purchasing and Stores jointly developing schedules for requisitioning material of a like nature. We believe this effectively levels out workload in both elements, permitting better and more economic inventory control and buying.
- The use of requisitions which include requirements for a six-month to one-year period, with the requisitions establishing delivery of the material at various intervals of time. This allows Purchasing the option of performing the buying function once instead of three to six times. It allows Purchasing to place part or all of the business available dependent on current and foreseeable market conditions. Furthermore, extended delivery schedules are generally advantageous to the vendors and give the customer a better assurance that material will be delivered on time. Inventory control need not be sacrificed since adjustments may be made during the term covered.

What has been suggested is merely an extension of planning, which all companies are now doing in requisitioning, in establishing requirements and controls, or in using blanket orders. In a survey last year it was determined that practically everyone is using blanket or open-end orders. The greatest use appears to be made when acquiring specific commodities, with over 90 percent of the companies using them in this fashion. Practically all blanket orders for such material are priced. In order of declining usage, such orders are also finding application for obtaining miscellaneous items required by specific using elements, for items required by a geographic area or district, and for nonpredictable items for a specific job. In the same order, such commitments progressively change from priced commitments to unpriced ones.

Advantage of Blanket Orders

One of the major advantages of blanket orders is the elimination of work through reducing the number of purchase orders written. However, in many cases, the only releases that may be made against the blanket order are required in written form from the Purchasing element. In those cases where releases are allowed by other than Purchasing elements, 80 percent of the companies require that receiving reports for the material be written. Thus, we may not be taking full advantage of possible cost-saving techniques.

Why not issue blanket orders for materials required by a specific element so designed that release may be made by the element with no loss of control of the pro-

An address before the EEI Purchasing and Stores Committee Meeting, Houston, Texas, May 16, 1961.

curement function? This can be accomplished through a more complete exploration of needs and more attention to content of the purchase order. Delegation of the release activity can then be accomplished. After-action controls can be established. On such orders, too, we would recommend the trial of vendors' dray tickets as receiving reports. The dray tickets can be marked with appropriate accounting data, and then be approved and forwarded to the interested parties. Not only is there a reduction in writing with this method, but we believe receiving information is relayed faster. This is advantageous to the accounts payable element, and could result in better vendor relations through improved payment of invoices. The use of local orders are not as much in favor with those responding to the questionnaire as is the blanket order. Approximately 70 percent of the companies indicate some usage of this order form. Generally, use of a local order is restricted: in value of material; to material required for immediate usage; to material not included in M and S accounts; and to material available locally.

Local Orders Range from $25 to $50

The value limitations on these orders have an average range of $25 to $50. One company indicates a maximum limit of $100. Some companies have a special local order form issued by Purchasing to using elements in a book arrangement. Others require those using local orders to obtain order numbers from Purchasing, and still others require pricing and approval of local orders by the Purchasing element. Control of local orders is normally maintained through approval of invoices or a review of invoices after payment has been made. These two approaches are used about equally. At one time there seemed to be a concerted movement toward the use of the local order form. From the answers to the questionnaire, it would appear there might be some withdrawal from its use.

Cash-and-carry purchases, those charged to a petty expense account, are in the least favor, although two-thirds of the companies allow or promote this method. In companies that allow this type of buying, purchases are normally limited to $10, although there are companies which have a maximum limit of $25.

One company indicates the only limitation is the size of the fund available at the time of purchase.

Control over cash-and-carry purchases is more relaxed than over any other type of commitment procedure. Controls range from no control at all, to review by auditors or accounts payable, to after-action review of petty expense purchases by Purchasing. Is there a possibility of standardization when you consider the proper application of a local order vs. the use of a cash-and-carry procedure? A review in this area—along with the blanket order vs. "local" order review—could reduce three order procedures to two, possibly the blanket-order type and the cash-and-carry type.

Now that we have briefly explored ordering procedures, let's turn to effective administrative control. What is it? How do we make it effective? The dictionary defines administrative control as pertaining to a management act of direction over an operation. It also defines control to mean something that serves to control; a check; a standard of comparison.

In this book, *Management in Action*, Lawrence A. Appley, President of the American Management Association says: "Management has been defined in very simple terms in getting things done through the efforts of other people and that function breaks down into at least two major responsibilities, one of which is planning, and the other control.

"Planning encompasses a whole field of deciding what you want human beings to accomplish . . ."* He goes on to define control to include two factors which require careful attention, with the two being organizational structure and supervision. He further says "a function of supervision is to close the gaps between desired performance and actual human performance. If the mere issuance of policies and instructions would induce people to do what they're supposed to do, supervision would not be necessary."

Another man whom the utility industry knows, Prof. Robert T. Livingston of the Utility Management Workshop of Columbia University, writes the following about control in his book, *The Engineering of Organization and Management*:

"Certainly it is not enough to merely give a command. The command must be followed up. So any dynamic process requires control. This continuing process must adjust the operation to the variation in the environment, the demands or the supplies, and the occasion. For efficient control there must be continuous and detailed measures of accomplishment and comparison of accomplishment with intent. These measures should coincide with areas of authority and responsibility and in convenient temporal units. The purpose of control is to accomplish a desired goal. In spite of the best analysis and investigation, it is hardly to be expected that everything everytime will occur exactly as anticipated. Someone must make decisions as occasions arise. Someone must compare results with desire."**

Three Elements of Control

From the above quotes we see that control includes:

- A plan—determination of what you want to accomplish.
- Continuous and detailed measures of accomplishment.
- Comparison of accomplishment with what was desired.

In a section of Mr. Appley's book, *Management in Action*, devoted to good employee relations and their importance as a factor to a sound and successful business, he includes the following statements:

"Agreement (with an employee) on what constitutes a job well done can be brought about by the establishment of simple standards of performance, in terms of

* Appley, Lawrence A., *Management in Action*. New York: American Book—Stratford Press, Inc., 1956, p. 322.

** Livingston, Robert T., *The Engineering of Organization and Management*. New York: McGraw-Hill Book Co., 1949, p. 50.

quantity, quality, time, cost, and tests to be met. Working without standards is like participating in an athletic contest without a system of scoring."* "At regular intervals, check actual performance (with the person involved) against standards that have been set. If management is to plan its activities, it must know how big a gap there is between what is being done and what should be done. This should be checked in terms of individual and group attainment."**

Making Control Effective

These quotes appear to apply to organizational elements, as well as to individuals. If we consider the above as sound and logical definitions of administrative control, what steps are required to make control effective? Now, we believe, it must be agreed that the head of an element cannot watch every person and every operation continuously. He, therefore, needs to measure what has been done and compare the results with what was planned. To do this, he needs to take the following steps:

- He must decide what to measure.
- He must set up units in which to measure.
- He must decide how to measure.
- He must find some standards against which to compare.
- He must analyze the comparison with standard.
- He must determine what to do about it.

In approaching the establishment of proper steps to obtain effective control, one will not always (sometimes even rarely) be able immediately to identify the optimum measures or standards involved. Much of the development may require a trial and error method. Possibly the initial standards will be based only on historical records with further experience allowing for better development in the future. In any event, the basic items measured, the standards developed, and the analysis made today may not be the same as they will be tomorrow. At best, due to improvement of operations, the significance of any measure will vary with time. In the over-all approach to control, therefore, certain principles must be recognized. They are:

- *The principle of economy*—The cost of obtaining data should be commensurate with the value of the data.
- *The principle of soundness* — Units, measures, methods and standards must be realistic. Comparison, for example, with a "padded" budget as a standard is meaningless. Another example would be the number of orders handled per clerk, which is far more useful than, say, the number of orders handled per dollar of revenue.
- *The principle of identification*—Measures or control points should be established when they will be most effective, when they will give notice of something going wrong, where they will aid in the job of supervision.
- *The principle of analysis*—All the measuring and recording is meaningless unless an effort is made to ferret out the real meaning of the comparative information available.

All of the foregoing, of course, can apply to any element of any company. It certainly is not restricted to application within any utility or within any Purchasing element. One of the main points is the measurement of performance, not just once, but on a repetitive basis. As F. M. Reinhold stated more than once in his presentation before this group last year, "to measure performance regularly is to improve performance."

With this in mind, the committee submitted its questionnaire to the member companies. We believed a review of measurements made by all companies might point the way for possible improvements by each of us in measuring and analyzing and, thereby, controlling each of our operations.

Management must know the spread between what is being done and what should be done. This requires review, measurement and analysis of past activity. The first item in the questionnaire, therefore, was aimed at determining the group practice in the broad sense. Two-thirds of the companies responding indicate a periodic appraisal of performance. The cycles of the analyses fluctuate, with 30 percent of those appraising doing it monthly, 58 percent yearly, and 12 percent irregularly.

Upon completion of their analysis, 60 percent of the managers report them to their superiors, with an additional 10 percent indicating they do so when necessary. Here, some of us may be missing an obligation—that of keeping the top management of our company informed.

A second factor of the control procedure has been identified as determining what you want to accomplish. We may consider the establishment of a standard of performance as such a determination. Or, in other words, a standard of performance is then a statement of conditions that will exist when a job is well done. In this area, we find only 25 percent of the respondents have developed performance standards, with all but two of these companies having done so on an historical basis. Those two have arrived at "engineered standards" to aid in their control.

Measurements of Control

The third primary area connected with control is that of continuous and detailed measurements. The balance of our questionnaire was devoted to identifying the measures used. The major areas with the greatest degree of measurement are those of quantity and cost and expense. Quality is next in line, followed by planning. In the measurement of quantity of work, results of the questionnaire reveal the most measured items to be the number of business interviews held and the amount of sale of material; 40 percent so reported. Next in line are number of items purchased, number of open orders, and number of formal requests for bid. Four companies have standards established for the number of items purchased; this is the item having

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*Appley, op. cit., p. 325.
**Appley, op. cit., p. 328.

An Analysis of Fatal Accidents in the Electric Light and Power Industry in 1960

By W. C. Bremner
Superintendent of Safety, Commonwealth Edison Co.

ONE HUNDRED AND FIVE accidents which resulted in death in the electric utility industry were reported to EEI in 1960.

This is the second consecutive year that the figure has increased over the preceding year. Normally, as Figure 1 illustrates, the total is "up one year and down the next."

General Improvement

However, there has been a general improvement in the situation since 1947, and the total of 105 compares favorably with the 20-year average of 123. The 1951-60 figures are shown in Table I.

As in all other years, the number of electric shock and burn cases—80—accounted for most of the fatalities. These 80 cases resulted in a 36 percent increase over the 59 similar cases recorded in 1959. The 20-year average is 88, and the worst year was 1949, when 134 men were electrocuted, burned, or received a shock which caused a fall or other movement resulting in death.

The 25 non-electric shock and burn cases reported in 1960 were as follows:

- Motor vehicle, 7.
- Falls, 6.
- Caught in, or crushed, 5.
- Struck by, 2.
- Miscellaneous, 5.

Because electric shock and burns accounted for so many fatalities, these accidents have been further analyzed.

Figure 2 shows the month in which the electric shock and burn fatalities occurred, and varies but little from previous years—about half of the accidents occur in hot weather months. It has been my opinion for some time that there is a reason for this: men wear fewer clothes in hot weather and they perspire more. The careless contact made in winter, when a man is wearing heavy underwear, a flannel shirt, perhaps a sweatshirt, sweater, jacket, and jumper does no harm. The same contact in the summer, with the man wearing a sweat-soaked shirt, may result in a casualty.

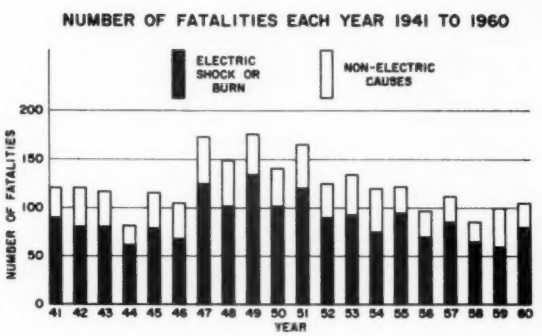

Figure 1

TABLE I—ELECTRIC SHOCK AND BURN FATALITIES
10 - YEAR PERIOD

		1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	TOTAL
Line Work on Poles or Towers	Hands	26	26	14	23	27	15	24	17	15	27	217
	Arms	19	11	11	9	16	9	6	7	9	6	99
	Head	1	7	7	5	5	2	1	1	3	7	39
	Neck	1	0	2	2	2	0	0	0	0	0	7
	Shoulder	4	3	4	0	4	4	6	0	1	5	31
	Body	4	1	7	4	4	2	5	3	2	2	34
	Leg or Foot	1	1	3	1	0	4	2	1	2	3	18
	Unknown	5	2	0	0	0	0	3	0	1	0	11
	Flash	2	1	3	3	4	2	0	1	0	0	16
	Gaff "Cutouts"	5	4	2	0	0	0	1	1	0	0	13
	Slip or Lose Balance	0	0	2	1	3	1	0	2	4	1	14
	Possible Heart Case	0	0	0	0	0	1	1	0	0	0	2
	Line Work from Ladder	1	0	0	0	0	0	0	0	0	2	3
	Line Work from Hyd. Tower	0	0	0	0	0	1	2	1	0	1	5
	Line Work in Trees	0	0	2	1	1	1	1	0	1	0	7
	Line Work on Ground	9	10	9	6	2	5	15	8	4	7	75
	Surveying	0	2	0	0	1	0	0	0	0	0	3
	Street Light Replacement	0	0	0	2	2	0	0	0	0	0	4
	Energized Cranes & Trucks	3	1	2	0	3	4	5	4	4	1	27
	Underground Work	0	2	0	1	6	1	0	1	2	0	13
	In Basements	2	0	2	1	0	0	0	1	0	0	6
SUB TOTAL		83	71	70	58	80	52	72	48	48	62	644
AT STATIONS OR REPAIR SHOPS		38	19	23	17	15	18	14	17	11	10	190
TOTAL		121	90	93	75	95	70	86	65	59	80	834

Review and Classification of 105 Fatal Accidents Reported and Power Industry — Compiled by the EEI Acc

* NOTE: 6 of the 105 reports were received after April 10, 1961 and are marked "L"

				PATH OF CURRENT									
				VICTIM		EQUIPMENT							
				ENTRY	EXIT	ENERGIZED	GROUND OR SECOND CONTACT	VOLTAGE	OCCUPATION	AGE OF VICTIM	YRS. OF SERVICE	YRS. IN THIS WORK	MONTH ACC. OCCURRED
ELECTRIC SHOCK OR BURN 80 CASES 76.2%	LINE WORK ON POLES 54 CASES	CONTACTS ESTABLISHED WHILE CLIMBING OR WORKING IN WORK POSITION, BUT WITHOUT CUTTING OUT OR LOSING BALANCE	HANDS 26 CASES	Left Hand	Right Hand	Sec. Wire or Neut.	Neut. or Sec. Rack	Secondary	Lineman	40	13	4	Jul
				Right Hand	Back	Service Wire	Neutral	240-120	Lineman	30	9	7	Jul
				Rt. Hand & Hip	Both Feet	Dangling Primary	Wet Earth	4000-2400	Line Foreman	34	10	10	Apr
				Left Hand	Upper Rt. Leg	Pole Ground Wire	Telephone Cable	4100-2400	Serviceman	26	4	1	Dec
				Left Hand	Left Leg	Prim. Wire	Prim. Wire	4125-2300	Foreman Serv.	34	13	13	Jun
				Left Hand	Left Foot	Arc Circuit	Sec. or Neutral	4160-2300	Lineman	33	9	9	Sep
				Hand	Leg	Prim. Wire	Wire	4160-2400	Troubleman	41	8		Oct
				Left Hand	Left Hip	Dn. Guy Above Ins.	Dn. Guy Below Ins.	7200	Lineman	31	13	7	Feb
				Right Hand	Both Feet	Clip on Cutout	Wet Pole	12000-7200	Lineman	43	8	14	Nov
				Both Hands	Left Leg	Prim. Wire	Grd. Down Guy	12000-7200	Lineman		½	3	Sep
				Right Hand	Left Hand	Trans. Prim. Neut.	System Neutral	12000-7200	Lineman 1st Cl.	36	9	7	Jul
				Right Hand	Feet (Assumed)	Conductor	Pole	12000-7200	Lineman 1st Cl.	48	24	5	Jul
				Left Hand	Left Leg	Conductor	Neutral Wire	12000-7200	Lineman	29	5	5	Mar
				Both Hands	Abdomen	Transf. Prim. Tap	Grd. Trans. Hanger	12000-7200	Lineman		3		Mar
				Right Hand	Left Hand	Stirrup on Cond.	Grd. X Arm Brace	12000-7200	Lineman 1st Cl.	39	12	9	Feb
				Right Hand	Undetermined	Conductor		12500-7200	Line Serviceman	51	13		Nov
				Right Hand	Left Elbow	Primary Jumper	Secondary Wire	12500-7200	Lineman	33	8	2½	May
				Right Hand	Right Foot	Phase Wire	Grd. Trans. Hanger	12500-7200	Combination Man	44	7	20	Jul
				Left Hand	Right Foot	Trans. Pri. Bushing	Secondary Neutr.	13000-7600	Lineman	27	9½	4½	Dec
				Left Hand	Both Legs	Conductor	Grounded Guy	13800-7600	Lineman	34	11	11	Jun
				L-Hand-Shoulder	Left Leg	Primary Wire	Down Guy	14400-7200	Appr. Lineman	27	3	1	Mar
				Right Hand	Both Feet	Conductor	Pole (Assumed)	14400-8400	Appr. Lineman	28	8	2	Jun
				Both Hands	Upper Lft. Leg	Conductor	Grounded Wire	23000	Lineman 2nd Cl.	28	1		Oct
				Right Hand	Both Feet	Cutout Switch	Trans. Brackets	23000-13200	Lineman 3rd Cl.	23			Apr
				Both Hands	Left Foot	Creosoted X Arm	Creosoted Pole	69000-40000	Lineman	51	17½		Mar
				Left Hand	Left Hip	Hook of Blocks	Deenergized Pri.	Str. Lt. Cir.	Lineman A	29	3½	10	Jun
			ARMS 6 CASES	Left Arm	Right Wrist	Foreign Wire	Ground Wire	450-260	Serviceman	28		8 mo.	Sep
				L-Arm & Chest	Right Leg	Prim. Conductor	Grd. Down Guy	4160-2400	Appr. Lineman	25	5½	3 mo.	Jun
				Upper Lft. Arm	Left Foot	Through Bolt	Secondary Rack	4160-2400	Lineman Grd. 1	25	5	2	Jul
				Upper Lft. Arm	Right Leg	Pri. Auto Deadend	Secondary Neutr.	4160-2400	Lineman 1st Cl.		10½	9½	Aug
				R-Arm-Shoulder	Crotch	Uncov. Prim. Cond.	Grd. Serv. Cable	4800	Serv. Lineman	47	15	15	Aug
				Upper Lft. Arm	Right Foot	Bottom of Cutout	Guy Bolt	8320-4800	Appr. Lineman	25	4	4	Oct
			SHOULDER 5 CASES	Left Shoulder	Left Leg	Discon. Jumper	Temp. Guy Wire	4160-2400	Appr. Lineman	28	2	2	Jun
				Right Shoulder	Right Thigh	Prim. Phase Wire	Wire Being Inst.	4160-2400	Lineman Hotstick	29	10	8	Aug
				Left Shoulder	Lft. Leg & Foot	Primary Wire	Neut-Guy Jumper	4160-2400	Appr. Lineman	22	3	2½	Aug
				Left Shoulder	Right Thigh	Fuse Switch	Prim Down Guy	13000-7600	Appr. Lineman	30	5	1½	Dec
				Left Shoulder	Left Leg	Prim. Conductor	Common Neutral	13200-7620	Lineman	29	7½	2	Apr
			HEAD 7 CASES	Top of Head	Right Hip	Bare Prim. Clamp	Secondary Cond.	4000-2300	Lineman	33	12	9	May
				Left Cheek	Right Thigh	Prim. Cutout	Common Neutral	4160-2400	Sub-Foreman	41	15	15	Aug
				Right Cheek	Left Leg	Prim. Jumper	Secondary Wire	4800-2400	Lineman	34	12	5	Jun
				Left Cheek	Right Hand	Hotstick Ferrule	Prim. Neutral	7200	Lineman	30	7		Aug
				Top of Head	Both Hands	Barrel of Cutout	Neutral Cond.	7200	Serviceman A	31	10	10	Apr
				Top of Head	Left Buttock	Trans. Pri. Jumper	Brace Bolt	12000-7200	Troubleman	58	38	38	Feb
				Back of Head	Both Legs	7 KV Phase Wire	Serv. Neutral	12500-7200	Troubleman	34	13		Nov
			BODY 2 CASES	Small of Back	Both Feet	Prim. Conductor	Transf. Case	12000-7200	Lineman A	26	8	4	Jun
				L-Side & Back	L-Foot & Leg	Open Cutout	Pole Grd. Wire	13800-7900	Lineman	34	10	5	Feb
			LEGS 3 CASES	Right Leg	Right Hand	Trans. Prim. Lead	Transf. Case	7200	Lineman	33	7	10	Dec
				Both Legs	Left Hand	Pole	System Neutral	13000-7600	Serviceman A	39	9	2	Sep
				Right Leg	Left Shoulder	Ener. Pole Grd.	System Neutral	14400-8400	Lineman	32	13	11	Mar
			WORK FROM AER. BASKET OR LADDER	Left Arm	Right Thigh	Trans. Prim. Tap	Ladder Rail	4800-2760	Line Foreman	56	23	23	Sep
				Hand	Hand	Wire	Cable	6900	Senior Lineman	37	13	6	Dec
				Chest	Unknown	Conductor	Aerial Basket	12000-7200	Lineman	62	32	32	May
			UNKNOWN	Point of Contact Not Known				240-120	Serviceman	43	20	20	Jun
		LOST BALANCE		Left Hand	R-Hand & Knee	Prim. Conductor	Grd. Neut. & Brace	4000-2400	Lineman B	38	13	8	Sep
	LINEWORK ON STEEL TOWER			Hand	Hand	Grounding Wire	Steel Tower	100000-57000	Lineman A	32	13	13	Oct
	LINEWORK ON GROUND 7 CASES			Left Hand	R-Foot & Thigh	Digger Controls	Wire Fence	2400	Lineman	34	10	10	Oct
				Hand	Feet	Prim. Conductor	Earth	4160-2300	Lineman Helper	44	9	9	Sep
				Left Shoulder	L-Shoulder-Back	Prim. Conductor	Earth	4160-2400	Serviceman 1 Cl.	43	19	19	Jul
				Both Hands	Left Foot	Energized Truck	Earth	12000-7200	Groundman #2	30	1	1	Jun
				Right Hand	Right Foot	Control Wire	Earth	12470-7200	Appr. Lineman	27	1½	1½	Nov
				Hands	Feet	Steel Truss	Earth	69000-34000	Utilityman	27	8	8	Mar
				Hands	Feet	Pole	Earth	69000-40000	Helper	23	2½	2½	Jun
	IN AND AROUND GENERATING STATIONS AND SUB-STATIONS 18 CASES	CLIMBED ON OR MOVED ABOUT ON STRUCTURE		Hand	Feet	Disc. Switch	Volt. Reg. Case	4800-2400	Lineman	25	1	1	Dec
				Left Hand	R-Hand & Knees	Substation Bus	Sub. Steel Struct.	8300-4800	Lineman	35	13	10	Oct
				Left Hand	Back of Head	Unknown	Unknown	46000-28000	Electrician	52	27	20	Nov
				Left Hand	Right Hand	Disc. Switch Blade	Jaw of Switch	69000-38000	Lineman 1st Cl.		19		Oct
				L-Foot (Maybe)	Unknown	Substation Bus	Sub. Steel Struct.	34500-20000	Elect. Foreman	50	27	25	Oct
				Flash - Apparently No Contact				34500-20000	Elect. Mechanic	34	11	11	Oct
				Flash - Apparently No Contact				57000-33000	Wireman	31	10	8	Nov
		CONTACTED ENERGIZED EQUIPMENT		Hands	Body	Shunt Disc. Blade	Grounded Barrier	4160-2300	Electrician		12	4	Apr
				Both Thighs	Hips-Shoulders	Gen. Lt. Arrester	Iron Framework	6600-3820	Operator-Hydro	29	3	3	Jun
				Buttocks	Buttocks	Generator Leads	Generator Leads	6600-Ungrd.	Operator	38	14		Jul
				Left Hand	Right Thumb	Test Lead Clip	Metal Ring	7200	Trans. Repairman	33	11	8	Aug
				Left Arm	Right Foot	Lightning Arrest	Steel I-Beam	13200-7600	Lineman	28	4	2	Oct
				Hands	Both Feet	OCB Bushing	Earth	46000-26500	Const. Mechanic	52	6½		Jan
				Flash - Apparently No Contact		Cable Conductors	Cable Sheath	4000-2150	Mechanic Gr. A	44	13		Oct
				Flash - Apparently No Contact		Cable Conductors	Cable Sheath	4000-2150	Mechanic Gr. A	60	31		Oct
		CAUSED SHORT CIRCUIT		Flash - No Personal Contact		Oil Cir. Breaker	Dummy Breaker	4000-2400	Serviceman 1 Cl.	43	18	18	Mar
				Flash - No Personal Contact		Oil Cir. Breaker	Dummy Breaker	4000-2400	Serviceman 1 Cl.	38	14	14	Mar
				Flash - No Personal Contact		Oil Switch Blade	Grounded Clips	13800	Troubleman				

...ts Reported During 1960 Within the Electric Light ...the EEI Accident Prevention Committee

ELECTRIC SHOCK and BURN CASES

SERVICE	YRS. IN THIS WORK	MONTH ACC. OCCURRED	#	DESCRIPTION
	4	Jul.	1.	Replacing sec. wires; reached around pole and contacted live sec. with left hand; right hand on neutral. Altho belted in, victim fell 20 ft. to ground.
	7	Jul.	2.	Deceased cut a service wire and held it in his hand, while his body contacted the neutral or the other leg of 3 wire service.
	10	Apr.	2L	Public truck crashed into pole. Victim was clearing wires from top of truck with handline when another wire fell from pole, striking him across body.
	1	Dec.	3.	Transf. high side grd. connected to pole grd. but not to neutr. Victim contacted pole grd. wire and fell from pole. No rubber gloves or safety belt.
	13	Jun.	4.	While using hot sticks on 12 KV conductors above, victim apparently touched a 4 KV wire with left hand while his leg contacted another 4 KV phase.
	9	Sep.	5.	Attempted to splice arc circuit without rubber gloves. Arc circuit was energized by contact with primary several blocks away.
		Oct.	5.	To take up slack in supposedly dead primary wire, victim placed wire grip on cond. with bare hand. Cond. was alive thru transformer back-feed.
	7	Feb.	6L	Slack jumper energized guy thru pole hardware. Victim touched guy; fell a few ft., stopped with body across guy insulator (live above; grounded below).
	14	Nov.	7.	After connecting jumper from line conductor to cutout, victim received shock while removing section of fuse from cutout.
½	3	Sep.	8.	Advised that line was dead; proceded to remove existing dead-ends before line was grounded. Back feed thru a transformer energized the line.
	7	Jul.	9.	Disconnected transf. primary neutral; held it in left hand while right hand contacted system neutral. Was not wearing rubber gloves.
	5	Jul.	0.	Was installing line hose; right hand slipped on conducto, rubber gloves had been previously punctured. Did not test gloves before use.
	5	Mar.	1.	Attempted to remove hot line clamp from energized tap instead of dead tap. Was not wearing rubber gloves.
		Mar.	2.	Was detaching deener. prim. tap from transf. bushing; dead sec. lead (handled by another lineman) contacted live sec. Bus and ener. tap thru back-feed.
	9	Feb.	3.	Apparently was tracing (in air) proposed position of tap. Extended arm too far and touched phase wire with right hand while holding brace with left.
		Nov.	3L	Victim was re-deadening broken conductor. As he thread it into the deadend clamp, he apparently made a brushing contact with it and fell from pole.
	2½	May	4.	As victim inserted hot tap clamp in jaws of shotgun, jumper contacted fuse, energized thru transf. back-feed. His left elbow was against a sec. wire.
	20	Jul.	4L	After climbing pole and belting in, victim tossed handline so it would clear a ditch. In so doing, his bare hand contacted an energized deadend clamp.
½	4½	Dec.	5.	While untangling handline, victim put left hand on deener. transf. prim. bushing. Secondary lead flipped into live secondaries, energizing transf.
	11	Jun.	5L	While attempting to install jumper between two 13.8 KV circuits, victim contacted conductor. His legs were touching grounded guy
	1	Mar.	6.	Deceased placed hand on ungrounded deenergized primary while astride a down guy. Primary became energized from a remote point.
	2	Jun.	7.	Contacted prim. wire while removing hose and hoods with bare hands. Fell 25 ft. to ground, striking back of head on rocky area.
		Oct.	8.	Was replacing deener. conductor. End flipped over barrier into energized circuit. Victim's leg was in contact with another wire sagged to ground.
		Apr.	9.	Job was to transfer equip. from old pole. Victim contacted cutout on old pole from his position on new pole. Started work before line was deenergized.
½		Mar.	0.	Was replacing crossarm. When deceased up-ended arm to lower it, it contacted the conductor above or came close enough to draw an arc.
½	10	Jun.	1.	Contacted ener. str. lt. conductor with hook of block held in gloveless hand; hip was in contact with dead pri. Str. lt. cir. was believed to be dead.
	8 mo.	Sep.	2.	While climbing into position (and unbelted), victim contacted pump control cir. wire fastened to pole with house knobs and energized at 450-260 V.
½	3 mo.	Jun.	3.	Was straddling guy wire. While deadending live prim. conductor in automatic deadend, victim put his arm over conductor, blocks and wire grip.
	2	Jul.	4.	Attempted to slide hose between prim. wire and pole-top bayonet. Wire contacted bayonet, energizing thru bolt. Victim's left arm was touching bolt.
½	9½	Aug.	5.	Climbed pole; had not fastened safety when arm contacted automatic deadend and right leg was against sec. neutral. Fell backward onto secondaries.
	15	Aug.	6.	While straddling grounded service cable, victim contacted unprotected section of primary wire he was transferring from old pole to new pole.
	4	Oct.	7.	In process of tying-in conductor, victim's left elbow contacted bottom of 15 KV fuse disconnect. Right foot was resting on guy attachment.
	2	Jun.	8.	As deceased swung around pole, his shoulder contacted jumper extending from bottom of live disconnect. Feet were on or close to grounded guy.
	8	Aug.	9.	Was pulling in new wire. Shoulder (above rubber sleeve) touched phase wire under line hose. Leg was in contact with new wire sagged to ground.
	2½	Aug.	0.	As victim lifted phase wire, hose came off, allowing conductor to touch his shoulder. Left foot was in contact with neutral jumper to grounded guy.
	1½	Dec.	1.	While fastening safety, victim's L-shoulder contacted top spring of Trip-O-Link switch; right leg was touching guy wire. He fell to ground after shock.
½	2	Apr.	2.	Pin on arm being removed and lowered caught on primary wire and pulled it into contact with victim's shoulder. His leg was touching neutral wire.
	9	May	3.	Climbed too high; straightened up to belt-in, head contacted bare prim. clamp. Hip was against secondary. Not wearing hard hat. Fell to ground.
	15	Aug.	4.	While straddling bare neutral, deceased leaned over to nail conduit straps. Left side of face contacted hood of energized cutout.
	5	Jun.	5.	While placing pin in strain insulator, victim's right cheek made contact with unprotected prim. jumper. Left leg was touching secondary wire.
		Aug.	6.	Side of face contacted hotstick ferrule hanging on clamp of sidconnected jumper. Jumper was energized thru cutout. Right hand touching prim. neutral.
	10	Apr.	7.	Victim, unbelted, leaned back to read trip-counter of serv. restorer. Bare head touched bottom of cutout; hands were holding sec. neutr. Fell 25 ft.
	38	Feb.	8.	On rainy day, victim placed left leg over sec. arm. Head contacted live prim. jumper and he fell to ground. Not belted in. Not wearing a hard hat.
		Nov.	9.	After belting-in, victim straightened up and back of his head contacted prim. wire; feet were in contact with netr. and grounded guy. No safety hat.
	4	Jun.	0.	Old wire being lowered across highway was caught by passing car. Sudden tension pulled temporary arm and victim (on pole) into live exposed conductor.
	5	Feb.	1.	Against instructions, victim climbed high on transformer pole. His back contacted open cutout; his left foot was against the pole ground wire.
	10	Dec.	2.	Transf. was being lowered; sec. leads contacted live secondaries, energizing transf. Victim's leg was touching prim. lead, hand was on grounded case.
	2	Sep.	3.	New pole was set next to old pole. New pole became energized when it "leaned" into prim. wire. Serviceman on pole had his bare hand on system neutr.
	11	Mar.	4.	Allowed 8 KV jumper to fall into arrester, energizing the arr. ground. Right leg was against arr. ground, left shoulder contacted system neutral.
	23	Sep.	5.	Working from platform of aerial ladder which was resting against neutral, victim's left arm contacted bare connector of prim. tap. No line hose used.
	6	Dec.	6.	While working from ladder truck making temporary repairs to 3-conductor cable, employe received fatal electric shock. No rubber gloves worn.
	32	May	7.	Victim in aerial basket released conductor snagged on abandoned pole. Lost control and cond. struck him in cheet. Fiberglass basket flashed over.
	20	Jun.	8.	Installed grounded street light, then shifted position on pole. Apparently contacted secondaries and light bracket simultaneously. No visible burns.
	8	Sep.	9.	Bumped head or face; apparently reached out to catch himself and contacted phase wire. At the same time, his knee touched the grounded neut. & brace.
	13	Oct.	0.	Deceased removed ground clamp from tower before disconnecting conductor end. He received electric shock from voltage induced by other circuit.
	10	Oct.	1.	Victim was leaning across wire fence, operating the boom controls at rear of the truck without wearing rubber gloves. Boom contacted primary wire.
	9	Sep.	2.	A deenergized prim. wire being lowered contacted a live primary. Victim, standing on ground, reached for the handline hook and fell over backwards.
	19	Jul.	3.	Was walking near fallen wire, broken by tree limb during storm. Slipped on wet grass on terrace and fell on wire.
	1	Jun.	4.	Boom was raised to highest position to lay pole auger onto truck bed. Victim was climbing up on truck just as the boom contacted an energized line.
1½	1½	Nov.	5.	Was on ground, pulling control wire over arms. Right hand was on pulling rope, other on wire. Wire sagged into live 12 KV several spans away.
	8	Mar.	6.	Was guiding steel tower truss suspended by boom. Boom contacted or came close to energized conductor. No visible marks found on body.
2½	2½	Jun.	7.	Victim on ground was using both hands to help guide pole into hole. Pole ground wire, extending above pole, contacted energized 69 KV line.
	1	Dec.	8.	Climbed voltage regulator to untie wires on temp. arm. Hand contacted reg. by-pass switch blade, alive thru back-feed. Not wearing rubber gloves.
	10	Oct.	9.	Climbed substation structure to replace span of wire. Placed left hand on top of post insulator supporting live bus. Fell backwards to ground.
	20	Nov.	0.	Victim was working in deenergized section of substation structure 30 ft. above ground. Moved into energized section and contacted live equipment.
		Oct.	1.	Climbed beyond deenergized section of substa. structure. Attempted to pass between two 69 KV insulator stacks. Contact caused victim to fall 35 ft.
	25	Oct.	2.	Was walking along beam. Apparently lost balance and contacted live bus with left shoe. Resulting arc set his clothing on fire and he fell to ground.
	11	Oct.	3.	Deceased climbed up into live substation equipment, presumably to inspect something. An arc developed and he suffered burns over 95% of his body.
	8	Nov.	4.	Victim was crossing steel members of substa. 25 ft. above ground pulling handline. Either he or the line contacted live bus. Flash caused fatal fall.
	4	Apr.	5.	Crew was painting substa. walls. Victim at top of extension ladder was securing it with rope sling. Rope contacted live equip. and flash resulted.
	3	Jun.	6.	Jumped from walkway to pick up fishing lure before fellow employe could reach it. Transite housing gave way and victim fell into live generator equip.
		Jul.	7.	Entered generator pit for some unknown reason. Sat down on 660 volt generator leads and was badly burned.
	8	Aug.	8.	Making ratio check of trans. in test lab; victim reached over safety gate and grasped live test lead. Thumb was on safety interlock button metal ring.
	2	Oct.	9.	Installing sheet metal barrier under lightning arrester. Arm contacted 13 KV lead, arc rendered him unconscious and he fell, hanging by safety belt.
		Jan.	0.	While erecting a bldg. next to a substa., victim, on the ground, was turning a piece of sheet steel end-for-end, when it contacted an oil cir.br.bushing.
½		Oct.	1.	Was drilling thru concrete wall with pneumatic drill. Bull-point struck imbedded live 4 KV cable, resulting in flash. Victim died 4 days later.
		Oct.	2.	Same accident described as No. 71. Victim died 5 days after accident.
	18	Mar.	73.	Through unfamiliarity, and without authority, victim inserted dummy breaker instead of grounding device into cubicle causing short circuit on 4 KV bus.
	14	Mar.	74.	Same accident described as No. 73. (Two men killed by heavy arc.)
			75.	Entered substa. to do switching. Explosion occurred. Apparently when ground latch pin was removed, live switch fell or was moved into ground position.

NON-ELECTRIC SHOCK and BURN CASES

		OCCUPATION	AGE OF VICTIM	YRS. OF SERVICE	YRS. IN THIS WORK	MONTH ACCIDENT OCCURRED	
FALLS 6 CASES 5.7%	45 ft. pole with 4 KV, Sec, Transf, Str. Lt. Cir.	Lineman 1 Cl.	38	13	2½	Apr.	76. Wh
	55 ft. pole with 12 KV, Sec, Transfs, Tel. Wires	Lineman		36	4	Mar.	77. Wa
	40 ft. pole with 550 pound air switch near top.	Lineman	56	24	16	Nov.	78. Im
	Old 35 ft. pole with wires to North, South, West.	Lineman	32	8½	12	Feb.	78L Vi
	Substation steel structure and breaker cases.	Substa. Tech.	32	12	8	Oct.	79. Su
	On cliff near river - no equipment involved.	Project Engr.	53	19	6	Aug.	80. Wh
STRUCK BY 2 CASES 1.9%	40 ft. pole lashed to 30 ft. on top of creek bank.	Laborer	22	2 mo.	2 mo.	Oct.	81. 75
	Crew was installing service pole and service.	Lineman	53	7	32	Jan.	82. As
CAUGHT IN OR CRUSHED 5 CASES 4.8%	Unloading pole from two-wheel pole trailer.	Line Helper	24	2½	1½	Jun.	83. Cr
	Line truck parked along curb during hurricane.	Equip. Operator		10	7	Sep.	84. De
	Building transmission line in mountainous area.	Driver Sp. Equip.	49	18	10	Mar.	85. At
	Repairing terraces near base of earthen dam.	Gardener	32	9 mo.	9 mo.	Oct.	86. Ga
	Stop-log gate on powerhouse turbine.	Struct. Iron Wk.	37			Jul.	87. St
MOTOR VEHICLE 7 CASES 6.7%	Icy highway at top of hill.	Material Co-ord.	43	13		Dec.	88. Ca
	2 lane U.S. highway covered with snow and ice.	Superintendent	43	10	3	Mar.	89. Wa
	Fell asleep on freeway.	Cable Splicer	43	15	14	Sep.	90. Wa
	Truck struck by car at rural intersection.	Lineman 1 Cl.	33	9		Jun.	91. Em
	Truck digger on state highway with 2 man crew.	Equip. Operator	30	12	7	Aug.	92. Co
	Co. car on 2 lane state highway in rural area.	Home Serv. Rep.	36	13	13	Apr.	93. Af
	RR crossing within city limits of small town.	Serv. Manager	55	32	19	Feb.	94. Al
MISCELLANEOUS 5 CASES 4.8%	Steam generator being chemically cleaned	Aux. Equip. Oper.	28	7	2	Dec.	95. Wa
	Acting as night watchman in office-type trailer	Laborer	57	10	10	Jan.	96. Co
	Operating floor scrubber in turbine room	Maint. Sup't.	55	36	11	Mar.	97. Wa
	Crew set pole in slight valley	Appr. Lineman	28	9	9	Sep.	98. Wh
	Cesspool near hydro plant in mountains	Labor Gr. 3	32	10	10	Sep.	99. Dr

* NOTE: Six of the 105 reports were received after April 10, 1961, and are marked "L."

The ages of the victims and the number of years of experience are shown below:

Age of Victim	Number of Cases
21 to 25 Years	7
26 to 30 "	20
31 to 35 "	19
36 to 40 "	7
41 to 45 "	9
46 to 50 "	4
51 to 55 "	4
56 to 60 "	3
61 to 65 "	1
Age Not Shown	6
Total	80

Years of Experience	Number of Cases
Less than 1 Year	2
1 to 3 Years	17
4 to 6 "	10
7 to 10 "	19
11 to 15 "	9
16 to 20 "	5
21 to 25 "	2
26 to 35 "	1
36 or More"	1
Not Shown	14
Total	80

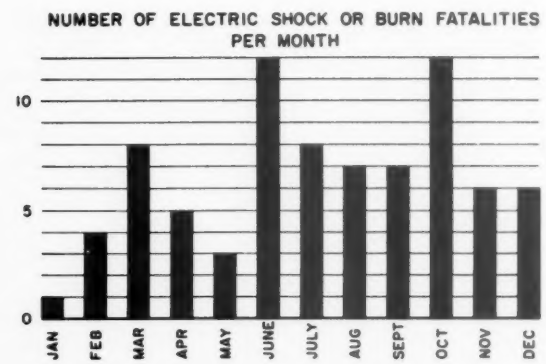

Figure 2

It can be seen that once a man reaches the age of 35 and has 10 or 15 years of experience in line work, he has learned pretty well what must be done at *all* times to protect himself. It recalls a well-known saying among linemen: "There are old linemen, and there are dumb linemen, but there are no old dumb linemen."

As was true in previous years, weather was a factor in only a few of the fatalities:

Fair or clear	52
Hot — humid	4
Cloudy or damp	7
Raining	7
Snow — sleet — ice	2
Not reported	8
Total	80

The reasons given on the Confidential Reports of Employee Work Injury as to the cause of the accidents are shown on page 279. In 66 of the 80 fatalities *an unsafe act by the injured* was the primary cause, the secondary cause, or was one of several that were checked.

YRS. IN THIS WORK	MONTH ACCIDENT OCCURRED	DESCRIPTION
2½	Apr.	76. While installing crossarm, victim fell to ground. Unknown whether he was changing position and lost grip on pole, or snap was not securely engaged.
4	Mar.	77. Was paralleling sec. leads of transf. bank. When partner closed prim. cutout, arc occurred. Victim slipped thru safety belt and fell 32 ft. to ground.
16	Nov.	78. Improper balance of winch line on top-heavy pole caused victim (holding line around butt) to be lifted 30 ft. when pole up-ended. He fell to ground.
12	Feb.	78L Victim was stripping old pole for removal. When he cut the 7 wires to the south, pole broke and fell northwest. He suffered fract. skull & broken neck.
8	Oct.	79. Substation technician attempted to climb from ladder to steel beam while painting substa. structure. Fell 20 ft. to ground and died 11 days later.
6	Aug.	80. While taking pictures near dam site for project under construction, engineer fell 30 ft. from trail on rock cliff into river and drowned.
2 mo.	Oct.	81. 75 ft. pole was being set, using a shorter pole as a gin. Water soaked soil gave way and poles fell. Crew scattered, but pole hit victim 37 ft. away.
32	Jan.	82. As lineman walked from truck to house, 24 pound limb, cut by tree trimmer, fell on his hard hat. Cradle webbing had previously been removed from hat.
1½	Jun.	83. Crew was lifting pole off trailer by hand, 7 men on one side, victim on other. As pole was lowered, it bore him to ground, fracturing skull and neck.
7	Sep.	84. Deceased was sitting in cab of truck during hurricane. He was crushed when 40 inch diameter tree 18 ft. away fell on roof of cab.
10	Mar.	85. Attempted to drive tractor, loaded with tools and rigging, down 45° slope. Tractor overturned, throwing victim out and rolled over his head.
9 mo.	Oct.	86. Gardener was rebuilding terraces near a dam. He lost control of tractor which overturned and crushed him between tractor and scraper.
	Jul.	87. Stop-log gate was being raised for repairs when hoisting equipment failed. Gate started to fall; victim tried unsuccessfully to get out of the way.
	Dec.	88. Car driven by Materials Coordinator skidded on black ice at slight curve on oiled highway. Vehicle rolled over him, breaking his neck.
3	Mar.	89. Was returning to headquarters on snow and ice-packed highway. Collided with approaching tractor-trailer which jack-knifed in front of company car.
14	Sep.	90. Was driving motor vehicle on freeway; went to sleep and car went out of control. Brain concussion resulted in death.
	Jun.	91. Employe was center-seat passenger in cab of truck struck by foreign make car which ignored stop sign; he was crushed when truck turned over on him.
7	Aug.	92. Company truck ran partly off road to avoid head-on collision, but was struck by oncoming car. Employe was thrown from truck and pinned underneath.
13	Apr.	93. After negotiating slight curve, company car collided head-on with car believed to be partly over center line. Both cars were traveling at high speed.
19	Feb.	94. Although RR signal lights were working, victim drove service truck at 10-15 mph into path of train at crossing. Body was crushed.
2	Dec.	95. Was operating control valve on tank containing hot citric acid. Elec. circuit to pump opened and acid overflowed onto victim. He was found on floor.
10	Jan.	96. Contrary to supervisor's orders, deceased built fire in 5 gal. can inside of trailer. In the course of the evening, carbon monoxide caused death.
11	Mar.	97. Was moving power driven floor scrubber to clean the turbine room floor. He felt faint and stopped. Ambulance was called. Dead on arrival at hospital.
9	Sep.	98. While cleaning the digging tools, victim was struck in chest by .22 caliber bullet fired by hunter hidden by brush and high grass.
10	Sep.	99. Drove tractor over unmarked cesspool. Cover, made of RR ties with 2 inch plank and 1½ ft. of earth, gave way, dropping tractor and victim, who drowned.

	Primary Cause	Secondary Cause	One of Several Causes	Total
Unsafe Act by Injured	22	8	36	66
Unsafe Act by Another	3	1	8	12
Rules Not Followed	11	13	27	51
Improper Work Method	2	6	36	44
Improper Supervision	4	6	19	29
Equipment Failure	2	—	2	4
Not Reported				2

The items of protective equipment required but not used are listed on page 292. Figures add to 106, because in many instances several protective items were omitted or improperly applied. There were 24 cases where apparently all protective equipment required was used, but an incident occurred which was beyond the scope of protection, such as a shoulder contact while wearing

(Continued on page 292)

TABLE II—TWENTY YEARS OF FATAL ACCIDENTS IN THE ELECTRIC LIGHT AND POWER INDUSTRY—1941 TO 1960, INCLUSIVE

Year	Total Fatalities	Electric Shock or Burn	Falls	Motor Vehicles	Struck by	Burned by Fire or Acid	Caught in	Drowned	Miscellaneous
1941	121	90	11	8	4	2	3	1	2
1942	121	81	19	11	6	3	0	0	1
1943	117	81	14	3	7	5	1	3	3
1944	82	62	6	5	6	1	2	0	0
1945	116	79	14	6	5	4	3	3	2
1946	105	68	19	8	5	0	2	2	1
1947	173	125	20	8	13	3	2	1	1
1948	149	102	21	13	6	2	2	0	3
1949	176	134	16	13	6	1	5	1	0
1950	141	102	13	9	4	4	0	5	4
1951	165	121	21	8	4	4	1	5	1
1952	125	90	7	17	4	0	1	1	5
1953	134	93	18	12	6	1	0	0	4
1954	120	75	17	14	6	0	2	0	6
1955	122	95	12	0	5	2	1	3	4
1956	97	70	10	6	4	2	2	3	0
1957	112	86	11	6	2	4	1	1	1
1958	86	65	5	3	3	1	6	2	1
1959	100	59	14	13	4	4	2	2	2
1960	105	80	6	7	2	1	5	1	3
20-Yr. Total	2467	1758	274	170	102	44	41	34	44
1960 Percentages		76.2	5.7	6.7	1.9	1.0	4.8	1.0	2.8
20-Year Average (%)		71.2	11.0	6.9	4.1	1.8	1.7	1.4	1.8
Minimum %		59.0	5.4	0.0	1.8	0.0	0.0	0.0	0.0
Maximum %		77.9	18.1	13.2	7.5	4.3	7.0	3.5	5.0

Transmission and Distribution Committee Meeting

- *Service Reliability Programs*
- *Recruiting Engineers*
- *Aluminum Transmission Tower*

H. E. CODY
Chairman

THE spring meeting of the Transmission and Distribution Committee was held May 18-19 at the Netherland Hilton Hotel, Cincinnati, Ohio. S. M. Hamill, Jr., Vice President, Electric Department, The Cincinnati Gas & Electric Co., welcomed the 205 members and guests to Cincinnati.

General Engineering

H. R. McNutt, Jr., Chairman of the General Engineering Subcommittee, sponsored a session featuring discussion of service reliability.

H. L. Collins gave details of a new system of service and facility performance records and anlyses being established by the Pennsylvania Power & Light Co. It is designed to provide a more realistic measurement of service performance, improve means of pinpointing areas deserving attention, and provide a better means of evaluating system design, specific items of equipment and operating and maintenance practices.

T. Hunter described Duquesne Light Co. experience with the relation of tree trimming expenditure to primary conductor failures due to tree interference.

V. O. Bernthal discussed how the Commonwealth Edison Co. uses service interruption records to pinpoint trouble areas. This is accomplished by recording interruptions according to detailed cause, system component involved, and small geographic area.

Z. Todd presented a method for using historic failure rates of components to calculate outage frequencies at any point in a transmission and distribution system. The method was demonstrated by sample calculations using equipment outage rates developed for the Indianapolis Power & Light Co. and comparing calculations with actual experience.

C. Kiehl discussed a failure on the copper side of an aluminum connector joining old copper and new aluminum conductors on a Long Island Lighting Co. transmission line.

Underground

J. F. Hennessy, Chairman of the Underground Subcommittee, sponsored a session covering a variety of subjects.

M. R. Mosquini presented a paper by R. C. Blankenburg describing use of precast concrete for underground applications on the Southern California Edison Co. system. Considerable economies have resulted from the use of accurately made rugged steel forms, lightweight aggregate, steam curing, simplification of specifications and a reduction of the number of types needed. J. Dorris, Quikset Utility Vaults, presented a movie showing placement and assembly of precast vaults on site.

W. J. Montgomery gave details of the operation and maintenance of secondary network systems of The Cincinnati Gas & Electric Co.

H. L. Davis, Jr. announced completion of the 1959 Cable Operation Report. Data from the major users of paper and lead duct-lay cable 7.5 kv and above show a trouble rate of 8.8 per 100 cable miles in 1959 as compared with 8.4 in 1958. Mechanical damage continues to be the principal cause of trouble.

R. M. Lewis described the program for scheduling engineering and construction work developed by the Boston Edison Co. Improved planning and scheduling under this program has provided ample construction time, reduced field costs, and enabled all jobs to be completed on schedule in 1960.

C. R. Machen outlined Pacific Gas and Electric Co. practices for providing underground residential service. Unsatisfactory past experience with direct buried cable on rear lot lines has led to exclusive use of duct systems laid in the parkway or sidewalk area.

R. H. Kolks gave a progress report on a cable movement investigation being conducted by The Cincinnati Gas & Electric Co. Although adequate-size manholes seem to provide the best general solution to the problem, strain gauge recordings show wide variations of movement which cannot easily be predicted.

Recruiting Engineers

Prof. E. D. Ayres of Ohio State University discussed problems in attracting electrical engineers to the power industry in competition with the glamour being associated with the electronics and missile industries. He suggested that power companies are not adequately advertising their own glamourous aspects, such as nuclear power generation, system control by microwave, applications of computers and the general automation of power system operations.

Overhead

J. Lummis, Chairman of the Overhead Subcommittee, sponsored the next session.

A report from R. Hicock reviewed progress on the tree growth control research project being conducted by Battelle Memorial Institute. Field tests of promising compounds are being conducted this spring and summer.

D. A. Campbell, Jr. reported that tests of the storm tracking plan for companies along the Eastern Seaboard indicate need for further refinements to speed the relay of messages.

C. H. Schofer gave details of a Pennsylvania Power & Light Co. study to determine the maximum thermal capacity of existing and future 230-kv transmission lines. Considerations included the reduction of

clearance at maximum conductor temperature, loss of strength from annealing and the probability of coincidence of high ambient temperature, low wind velocity and maximum circuit loading as determined from a study of hourly Weather Bureau data for the area.

H. L. Rorden presented a series of slides showing various applications of the "bare-hand" method of maintaining energized transmission lines recently introduced by the American Electric Power Co. C. J. Miller, Jr. of the Ohio Brass Co. described the laboratory development of the aerial lifts used for this method. Tests showed that an overhead shielding screen is not needed up to 138 kv.

M. R. Mosquini reported that Southern California Edison Co. investigation of connector failures reveals no basis for suspecting aluminum connectors to be less reliable than copper, and that improper cleaning is by far the leading cause of trouble. Consequently, the company has instituted a comprehensive educational and follow-up program on proper connector application.

J. M. Maples, Reynolds Metal Co., discussed development of a three-legged aluminum transmission tower. He stressed that the ability to extrude aluminum into almost any shape provides a flexibility for tower design not available with steel and helps to make aluminum more competitive.

Safety

The last afternoon opened with a session sponsored by H. W. Dannettell, Jr., Chairman of the Safety Subcommittee.

J. J. Misic described a closed-chest, heart massage technique recently adopted by The Cleveland Electric Illuminating Co. for use in combination with mouth-to-mouth artificial respiration in cases where the heart as well as breathing has stopped. Although the massage does not stop cases of ventricular fibrillation, it does pump blood through the body until other medical aid is available.

L. J. Renas outlined The Dayton Power and Light Co. practices for working 12-kv wye multigrounded lines with rubber gloves. A 16-inch, gauntlet-type glove is used in combination with various types of additional insulation devices, principally insulated platforms and insulated ladders.

Standards and Specifications

The final session was sponsored by H. G. Hally, Chairman of the Standards and Specifications Subcommittee.

I. M. Miller reported that the Timber Products Task Force is working on a proposed revision of specifications for full-length, thermal treatment of lodgepole pine poles. Preparation of new guides for treatment and inspection of creosoted pine poles and Douglas fir crossarms also has been initiated.

C. E. Topping reported that the EEI-NEMA Joint Committee on Pole Line Hardware is making good progress on proposed revisions of specifications for lag screws, washers, bolt-type insulator pins and wire holders, and new specifications for secondary extension brackets and aerial cable hangers.

F. E. Sanford stated that the EEI-NEMA Joint Committee on Connectors for Aluminum Conductors has almost completed a proposed revision of existing tentative specifications which will incorporate mechanical as well as electrical requirements.

H. MacVaugh advised that the proof-testing program to confirm proposed methods of providing for interchangeability of aluminum conductor compression connector tools and fittings is proceeding satisfactorily and should be completed by the end of the year.

A. T. Green reported that the EEI-NEMA Joint Committee on Standardization of Street Lighting Equipment is making good progress on a proposed revision of the existing standards for filament lamps and new standards for light sensitive controls. New projects include expansion of the existing standards for street lighting poles and new standards for a mercury vapor ballast and socket combination.

F. G. Josberger announced a favorable ballot on proposed EEI-IPCEA standards for #4 aluminum overhead service drop cable. The proposed standards provide for four different conductor combinations with a choice of polyethylene or neoprene insulation.

Electrical System and Equipment Committee Meeting

- *Indian Point Nuclear Plant*
- *Automatic Data Logging*
- *Southeast New York Power Pool*

R. G. MEYERAND
Chairman

THE Electrical System and Equipment Committee held its 84th meeting at the Hotel Roosevelt, New York, N. Y., May 14-16, with approximately 140 members and guests attending.

Reports, Papers, Discussions

The program consisted of reports, papers, and discussions under the sponsorship of F. J. Berger, Chairman of the Subcommittee on System and Equipment Troubles; K. L. Wheeler, Chairman of the Subcommittee on Equipment and Station Design; R. M. Pennypacker, Chairman of the Subcommittee on Equipment and Station Operation and Maintenance; N. C. Storck, Chairman of the Subcommittee on System Engineering and Operation; A. P.

Fugill, Chairman of the System Planning Subcommittee; and V. J. Hayes, Vice Chairman of the Committee and moderator of the round table discussion.

On May 15 the closed session was held, with the Subcommittee on System and Equipment Troubles presenting various reports on system disturbances and apparatus failures during the morning.

Mr. Pennypacker on Monday afternoon sponsored a series of reports from the manufacturers concerning motor troubles.

The program continued with two additional reports; one on diesel units and another on transformer noise.

A round table discussion of subjects of general interest, which had been submitted previously by members, was held for the remainder of the Monday afternoon closed session. Mr. Hayes, Committee Vice Chairman, was the moderator for this discussion period.

Indian Point Project

On Tuesday morning, under jurisdiction of the Subcommittee on Equipment and Station Design, Mr. Wheeler, through J. Q. Wray, Jr., sponsored a paper entitled "Indian Point Station Design Features." which was presented by Messrs. R. H. Freyberg and T. A. Griffin of Consolidated Edison Co. of New York, Inc.

The plant is located on the east bank of the Hudson River just south of Peekskill. The station site covers approximately 340 acres, including the high-tension substation adjacent to the station proper. The turbine-generator is a 275,000-kw, three-cylinder, tandem-compound, condensing-1800-rpm machine. The 16,500-volt generator is rated 343, 750 kva, at 52 psig hydrogen pressure, 0.8 p.f.

There are four heat exchanger-type boilers in the nuclear section which, with the aid of two oil fired superheaters, raise the steam temperature to 1000F. The four boilers are in separate water circulating loops, each loop being served by two canned rotor, vertical 1800-rpm centrifugal pumps, which with their associated boiler and piping can be isolated from the reactor vessel and other loops by two 24-in. stainless steel gate valves.

The fuel elements of the reactor are rod type, consisting of 195 rods, each made up of homogeneous pellets of fully enriched uranium oxide and thorium oxide encased in a stainless steel type 0.3-in. in diameter. The rods can be moved manually or by automatic controls to maintain a constant steam pressure at the boiler outlet.

The nuclear instrumentation is unique in that it has self-test and monitoring equipment in the safety networks. If the monitor finds an improper response an alarm sounds in the control room, and an operator is forewarned.

The major portion of the nuclear facility, including the entire primary coolant system and the relief tanks for that system, is housed in a 160′ diameter steel containment vessel designed for 25 psig internal pressure. A concrete cylinder five feet thick and 180′ in diameter surrounds the portion of the containment vessel above ground.

The fuel handling building is the storage building for both new and spent fuel. Pools are provided for underwater storage for as many as 2½ cores. A 30-in. diameter tube connects pools with the sphere canal in the containment vessel so that all operations connected with the movement of fuel can be done underwater.

The generator leads are brought out to a transformer yard by means of isolated phase metal-clad bus. The high-voltage side of each transformer is connected to the transmission tower by two 795 MCM ACSR cables bundled together to take the power to the Buchanan substation.

Automatic relay protection will cause immediate plant shutdown in case of any emergency. To insure reliable control and auxiliary bus power after a shutdown, four separate 13.8-kv light and power bus sections each supplied from a different source have been provided.

The Indian Point plant is expected to provide valuable experience and knowledge in the building and operation of an atomic-fired generating station.

Automatic Data-Logging

Mr. Pennpacker, through J. W. Asmann, sponsored a paper, "Experience with Data Logging Equipment in Substations," by Messrs. Milusich and Monacci of the Consolidated Edison Co. of New York, Inc.

Essentially, the data logging equipment automatically takes the desired readings in each remote station and transmits them to the control center, where the data is received and recorded on punch tape or in typewritten form, if required. The data are logged on the tape in a form which is readily handled by the conventional automatic tape-to-punch card business machines. Data, after being transferred to a magnetic tape, can also be processed on the electronic computer to obtain the conventional tabular log form.

The data logging equipment used is the transistorized type and employs audiotone transmission of the signals over leased telephone lines for both control and telemetering.

Mr. Asmann sponsored another paper in which H. W. Grissler reviewed the design features of his company's "Test Rack for Low-Voltage Switchgear" to the group. Public Service Electric and Gas Co. uses a test rack which enables an operator to test, inspect, and observe a low-voltage cubicle breaker in all of its operations and positions. This particular cubicle is used as a "standard cell" to check that all breakers move through their withdrawal and insertion sequences in the proper manner. Since some manufacturers check the trip units as separate items and perform no tripping checks on the completed breaker assemblies, it is necessary to verify the correct tripping operation of the breaker prior to installation. Current-time checks of the breaker trip mechanism is accomplished with the breaker in the fully connected position. This test procedure is very helpful as part of the company's preventive maintenance program.

Mr. Storck, with the aid of Mr. Stites, sponsored a paper, "The Southeast New York Interconnection," by H. C. Otten of Consolidated Edison Co. of New York, Inc.

The four Southeast New York State utilities have formed a new power pool that supplies New .York City and its surrounding counties with about 7000 mw of available power. The pool was organized to

coordinate the development and operation of the respective electric production and transmission systems to effect savings by joint use, to allocate savings equitably among member companies, to provide economic power interchange and to provide for purchase and sale of energy under agreed terms. Central Hudson Gas & Electric Corp., Orange & Rockland Utilities Inc., Consolidated Edison Co. of New York, Inc., and the Long Island Lighting Co. each has one representative on the Contract Committee and he serves as the company's agent in the interpretation and administration of the pool agreement.

The present scope does not include provision for the purchase or sale of energy from or to other utilities outside of the pool area. However, negotiations are in progress for the establishment of agreements between each of the four companies and the Niagara Mohawk Power Corp. for the purchase of economy or emergency energy.

A report on research projects, presented by W. B. Fisk, brought the committee members up to date on the status of various research projects of current interest.

Under the sponsorship of Mr. Hayes, two papers were presented on new developments.

F. R. Stuart reviewed his company's experience with SF6 gas-insulated transformers. Future use of this type transformer is being studied for large metropolitan stations or at any location where the absence of oil will result in appreciable savings in the over-all installation.

"Turbojet Power Generator Set" was the title of a paper in which K. L. Partridge described a new design peaking type of unit to be used by The Hartford Electric Light Co. The gas turbine generator, rated at 8000 kw and expected to develop 10,000 kw, is powered by a J-57 jet engine. This is the same engine which you have probably seen underneath the wing of a jet airliner.

K. L. Wheeler presented a paper, "Trends in Engineering Education and Their Impact on the Power Industry," in which he showed how engineering education today will have a strong influence on the future of the power industry. He pointed out that the industry must get its fair share of top engineering students graduating each year from schools that have stressed the humanities and basic sciences. These men will be better able to express their ideas orally or in writing and will be needed to produce better staff work and coordination within the company.

The meeting was concluded with a series of ASA committee reports that were very informative to the members.

Prime Movers Committee Meeting

- *University of Michigan Research Projects*
- *Air Pollution Developments*
- *Stream Pollution Task Force Report*

T. O. THOMPSON
Chairman

THE Prime Movers Committee returned to the Great Lakes area for its 103rd meeting, May 8-10. The three-day meeting held at the Hotel Schroeder, Milwaukee, Wis., marked the committee's first visit to the Wisconsin Electric Power Co.'s system since 1947.

Providing a forum for discussion of steam power station design and operating practices for 132 members and guests in attendance, the meeting was highlighted by more than 90 round table topics.

Reports were also presented on the activities of the committee's 17 task forces and subcommittees, and on the progress of special activities and research projects sponsored or partially supported by the Institute on recommendation of Prime Movers.

The usual committee inspection trip was made to the Oak Creek station during the afternoon of the second day, and a feature of the first evening was a visit to the Greendale Nuclear Laboratory of the Allis-Chalmers Manufacturing Co.

As the initial session was called to order, C. F. John, Vice President in Charge of Power of the host company, welcomed members and guests to Milwaukee and briefly described the Wisconsin Electric Power system. Mr. John pointed out that an historic item concerning their system is the fact that in 1882 the world's first hydroelectric central station was started at Appleton, Wis. Although this occurred on Sept. 30 of that year, just 26 days after the first operation of the Pearl Street Steam Station in New York City, people at Appleton claim that the hydro station there was actually started in construction before Pearl Street.

Before turning its attention to technical activities, the committee noted with pleasure the addition to its roster since the February, 1961, meeting of C. F. Jones, Duquesne Light Co.; J. R. Taylor, Public Service Co. of Oklahoma; and C. E. Weigert, Central Illinois Electric & Gas Co. A special welcome was extended to these new members.

Dr. J. W. Freeman of the University of Michigan, Metallurgical Consultant to the Prime Movers Committee, reported on the progress of research projects of interest to the committee being carried out under his direction at the university's Engineering Research Institute. Two of these projects, one on austenitic steel pipe welding failures, and one

on austenitic steels for high temperature service, are under the sponsorship of the Joint ASTM-ASME Committee on the Effect of Temperature on the Properties of Metals, with financial participation by EEI. Dr. Freeman is also evaluating data on ferrous and heat resistance alloys to confirm new allowable stresses in the ASME Boiler and Pressure Vessel Code specifications. This work is being financed by EEI on recommendation of the Prime Movers Committee.

J. U. Baley, Chairman of the Air Pollution Subcommittee, reported on recent national developments in this area, and urged committee members to participate in the activities of technical organizations interested in air pollution control. Mr. Baley also pointed out that the EEI Board of Directors at its March, 1961, meeting had authorized Institute participation in a research study directed at the measurement and evaluation power station stack plume opacity. EEI representatives on the group steering this work are Messrs. V. F. Estcourt, T. M. Hotchkiss, E. M. Parrish and V. L. Stone.

Venting of a Closed Feedwater Heater

J. K. Bryan, in presenting the report of the Boiler Auxiliaries Subcommittee, advised that this group is completing a study on venting of closed feedwater heaters. The results of this work will be reported to the committee in the near future. The subcommittee is also cooperating with the Electrical System and Equipment Committee in establishing a task force to study the use of sleeve vs. anti-friction bearings on electrical motors driving power plant auxiliaries, and to determine the most suitable bearings for this application. In addition, this task force, on which Messrs. J. A. Lind and W. H. Weise will represent Prime Movers, plans to study bearing temperature monitoring practices and to report findings and recommendations to the sponsoring committees.

The Chairman of the Boilers and Combustion Subcommittee, R. A. Baker, discussed EEI participation in the activities of several technical organizations interested in codes, standards, and research related to boiler design and operation. Mr. Baker emphasized the benefits resulting to the industry from participation by power station engineers in work of this nature.

Fly Ash Utilization Research

V. F. Estcourt, Chairman of the Equipment Availability Subcommittee, and M. D. Engle, Chairman of the Fuel and Ash Handling Subcommittee, reported on the progress of projects being carried out by their groups. An important assignment of Mr. Estcourt's subcommittee is the study of turbine and boiler operating experience of Prime Movers' company stations. Mr. Engle advised that the fly ash utilization research program recommended by the committee for EEI sponsorship at Battelle Memorial Institute had been approved by the Board of Directors at its last meeting, and the work is now under way. The project's Steering Committee consists of R. M. Homan and J. G. Koopman, in addition to Mr. Engle.

In conjunction with the report of the Metallurgy and Piping Task Force, Mr. Krieg, the task force Chairman, introduced K. H. Koopman, Director, Welding Research Council of the Engineering Foundation, who presented an illustrated discussion of research activities sponsored or supported by the council in areas of interest to the electric utility industry. Because of the importance of the WRC program to the industry, EEI, on recommendation of the Prime Movers Committee, provides financial assistance to this organization.

The Oil and Gas Power Subcommittee has undertaken a study on the past, present, and future use of gas turbines and diesel engines for peaking service. In reporting for this subcommittee, J. W. Blake also summarized the operation of a particular diesel engine installation.

H. C. Schroeder, Chairman of the Power Station Cost and Performance Data Subcommittee, referred to the results of his group's recent analysis of production expenses based on information provided by Prime Movers Committee members. A. C. Pasini, Chairman of the Power Station Personnel Subcommittee, reported that a questionnaire is being designed to be sent to members as an inital step in a study on steam power station personnel.

I. B. Dick, who has served during the past two administrative years as Chairman of the Power Station Chemistry Subcommittee, presented his last report in that capacity. Mr. Dick will be succeeded for the 1961-1962 committee year by A. O. Blatter, Union Electric Co. Mr. Dick briefed the subcommittee's 50th meeting, which was held in Detroit, Mich., April 10-12, with 81 members and guests in attendance. The subcommittee's sections on corrosion, water treatment, carry-over, air pollution, stream pollution, chemical cleaning, analytical chemistry, metallurgy, nuclear chemistry, power station by-products, and chemical instrumentation reported at that meeting. In addition, 113 round table questions were discussed.

In acknowledgement of Mr. Dick's outstanding administration of the subcommittee, a resolution was unanimously approved by the Prime Movers Committee extending its appreciation.

Power Station Data Report

J. A. Lind summarized reports that have been made available since the last meeting to committee members under the project sponsored by his one-man Power Station Data Subcommittee. P. H. Gravelle, Chairman of the Station Instruments and Controls Subcommittee, advised that this group has several subjects under consideration as possible future projects.

C. B. Vance, Chairman of the Turbines and Condensers Subcommittee, reported that plans are under way to up-date the subcommittee's 1949 study of turbine and boiler overhaul practices. F. A. Ritchings and E. D. Powell of this subcommittee are sponsoring work on turbine casing cracking that will involve distribution of a questionnaire to the committee's membership. As the result of round table discussion on power station hydrogen systems, the subcommittee is also directing attention to this subject.

The Chairman of the recently organized Stream Pollution Task Force, W. J. Robinson, reported that membership of this group has now been

formalized, consisting of, in addition to himself, M. A. Giles, Pennsylvania Power Co.; R. M. Homan, Gilbert Associates, Inc.; J. G. Koopman, Electric Energy, Inc.; S. T. Powell, Sheppard T. Powell & Associates; J. W. Purssell, Boston Edison Co.; and C. E. Richards, The Cleveland Electric Illuminating Co. The committee endorsed the recommendation of the task force that EEI authorize a modest expenditure in conjunction with the task force's project of keeping committee members advised of laws and regulations controlling water supply and pollution as they affect heated water discharge.

J. B. Taylor and E. S. Van Nostrand serve as the Prime Movers Committee liaison representatives on the System Planning Subcommittee of the Electrical System and Equipment Committee. Mr. Taylor summarized items of interest to the committee from the System Planning Subcommittee's February, 1961, meeting. J. G. Miller, the Prime Movers Committee liaison representative with the EEI Research Projects Committee, reported on the development of the Institute's new Research Division and the April 27, 1961, meeting of the group of liaison representatives serving with the Research Projects Committee from committees of the Institute's Engineering, Sales, and Accounting Divisions. The primary purpose of these liaison representatives is to maintain working contact between the Research Projects Committee and other technical Institute groups. These representatives are helpful in expediting consideration by their committees of project proposals forwarded to them by the Research Projects Committee for review and evaluation. The representatives also assist in the formulation by their groups of research proposals to be presented to the Research Projects Committee.

Committee Maintains Liaison

Research projects sponsored by the Prime Movers Committee are generally carried out under the direction of steering groups appointed from the committee. Where the Institute contributes, on recommendation of Prime Movers Committee, to programs sponsored by other organizations, a member of the committee is named to maintain liaison with the research work. The committee is kept apprised of the progress of each project by reports from steering committee chairmen and liaison representatives at each meeting.

A. C. Pasini discussed recent activities of the ASME Research Committee on Properties of Steam, on which he represents the EEI. The extension of steam tables research program, under the direction of the ASME committee, will require additional funding for completion. The EEI has contributed to this program.

P. H. Gravelle, EEI representative on the ASME Research Committee on Fluid Meters, reported that the testing program of this research project is now producing data. G. W. Bice, who follows the ASME high temperature steam generation project for the Prime Movers Committee, advised of the status of that project, which is under way at the Philip Sporn Station.

T. M. Hotchkiss and P. H. Hartung represent the Institute on the Joint Research Advisory Committee, which is steering the EEI-AEIC-Bituminous Coal Research, Inc.-sponsored sulphur - removal - from - coal - and - flue - gas - contaminants control program at the BCR Laboratories. Mr. Hotchkiss summarized recent progress of this work.

R. A. Baker, Chairman of the Boilers and Combustion Subcommittee, maintains liaison for the Prime Movers Committee with the Joint ASTM-ASME Committee on the Effect of Temperature on the Properties of Metals. Mr. Baker described the activities of the joint committee.

G. W. Bice, a member of the ASME Committee on Corrosion ond Deposits from Combustion Gases, reported that the EEI Board of Directors in March, 1961, had authorized contributions to the ASME committee's research program as recommended by the Prime Movers Committee. At the same time the Board of Directors also approved research contributions to the Corrosion Research Council and the Welding Research Council

(Continued on page 292)

Accident Prevention Committee Meeting

- *Stop Shock Emphasized*
- *Portable Defibrillator*
- *New Safety Film*

A. J. NAQUIN
Chairman

THE 71st meeting of the Accident Prevention Committee was held April 24-26 at the Edgewater Beach Hotel, Chicago. Fifty-eight of the committee's 79 members attended. Registration, including guests, exceeded 135 persons for the three-day meeting.

Following the invocation by the Rev. C. C. Hoskinson, Pastor of the First Congregational Church, Glen Ellyn, Ill., J. H. Ward, President of Commonwealth Edison Co., welcomed the committee.

In his general chairman's report, A. J. Naquin emphasized the many activities of the Stop-Shock campaign. Sixteen subcommittees, in their reports and studies, are making direct contributions.

In his report on new devices, F. W. Jones showed color slides and described many useful safety items. He also pointed out a few hazards to be guarded against.

S. H. Young offered a resolution

of respect and esteem in memory of William Leone, which was unanimously adopted.

The study made of man-hours of exposure by J. L. Shores and his committee indicated that a figure of 161.6 man-hours per employee per month was calculated from the statistics of those companies studied. It was recommended that those companies which cannot report actual man-hours worked give consideration to reporting on the basis of 165 man-hours worked per month.

Electric Shock Burn Summary

In presenting his electric shock and burn summary, Errol Dunbar pointed out that the honor roll of those companies which can report completion of the entire year without having electric shock, burn, flash, or fatal injury is growing. For 1960 the following seven companies so reported: Gulf Power Co., Central Vermont Public Service Co., Western Massachusetts Electric Co., Orange & Rockland Utilities Inc., Upper Peninsula Power Co., Jersey Central Power & Light Co., and New Jersey Power & Light Co.

Approval by the committee of the subcommittee's recent draft of "Use and Care of Pole Climbing Equipment," after some minor changes in wording and sketches were made, was given following presentation by J. S. Wantland.

W. C. Bremner discussed the preliminary draft of the "Review and Classification of Fatal Injuries." (See page 275.) There were 105 fatalities reported during 1960, of which 80 cases were electric shock and burn, and of these 49 were involved in line work on poles.

B. J. Lorenz reported that of the 12 replies received from members of the Transmission and Distribution and Transportation Committees, 10 offered suggestions with respect to the safe practices in the use of aerial baskets. The subcommittee will review these suggestions. Mr. Lorenz introduced H. L. Rorden of the American Electric Power Service Corp., who discussed the development of a method of using an aerial basket insulated from the ground to place workmen in a position to work effectively on energized conductors by bonding the basket and the man to the conductor. Mr. Rorden showed slides to indicate the technical aspects of properly placing the workman at the same potential as the conductor, and showed some special applications of the technique at extra-high voltages. The need for the workman to keep absolutely clear of ground was emphasized.

J. W. Gronbeck showed the new 12-minute, 35mm sound-slide, color film, "Anatomy of Electric Shock," produced by the Visual Aids Subcommittee. This film shows the important principles concerned with electric shock and is now available for $35 from EEI. He made a plea for members to make available their own films for adaption by the subcommittee, stating that there is need for more good films to promote the Stop-Shock effort.

The Resuscitation Subcommittee has under consideration the production of a training film, R. H. Coleman said. The committee expressed a sentiment for a film which would show pole-top resuscitation employing the mouth-to-mouth method, and for a film showing pole-top resuscitation, mouth-to-mouth, in combination with the Oesterreich method.

Latest Closed Chest Defibrillator

Dr. Kouwenhoven described and showed to the group the latest prototype of a portable closed chest defibrillator being developed by Mine Safety Appliances Co. This device contains capacitors which can be charged from either 6- or 12-volt d-c batteries, or 115-volt, 60-cycle a-c power source. When the safety electrodes are placed in proper contact and depressed, the capacitors discharge an a-c current sufficient to stop heart action in preparation for the restoration of normal rhythm. There have been no ill effects noted to the hearts of 500 animals tested, nor to two humans who suffered accidental contact. This portable equipment has been used half a dozen times on humans in the hospital. Refinements are still to be made. A movie produced at Johns Hopkins was shown which discussed the problem of ventricular defibrillation of the heart and the methods used to nourish the heart to maintain life in the victim and to defibrillate the heart. Dr. Kouwenhoven also said that at the request of the American Heart Association a team is being sent around the country to train doctors in the use of the closed chest counter shock defibrillator and in the method of closed chest cardiac massage. Dr. Kouwenhoven requests that he be given a report of every case involving the closed chest cardiac massage method.

Stop-Shock Participation

J. R. Hanford reported that the Shock Prevention Subcommittee felt the committee should work harder on the problem since it did not seem to be making consistent progress in the reduction of electric shock and burn contacts. In connection with Stop-Shock programs, J. W. Gronbeck reported on the excellent participation by line truck foremen in the Stop-Shock conferences arranged by the Accident Prevention Committee of the Electric Council of New England. H. B. McMahan repeated for the benefit of the committee the address he made at the annual recognition dinners of his company promoting the Stop-Shock programs.

The problem of properly grounding equipment as a protection to a man who is to work it dead was discussed by H. E. Hatfield for the Grounding Subcommittee.

The Non-Employee Overhead Line Contacts Subcommittee work was discussed by J. J. Head, who substituted for J. O. Leslie. The subcommittee is submitting ideas which come to its attention, and needs information on those accidents which happen in the industry, and of the materials which are being produced by individual companies.

P. E. Sheppard, reporting on the progress of the National Safety Council projects, said that the off-the-job program has progressed sufficiently so that it was found that there is an average frequency rate of 8.47, an average cost per injury of $350, and cost per employee per year of $9.

The Annual Motor Vehicle Accident Safety Report was distributed by E. H. Wessells. He said that there was a need for considerable more work and perhaps for an intra-plant

driver training program. The committee unanimously approved the use of the ASA D15 Code for the reporting of motor vehicle accidents effective as of Jan. 1, 1961.

Ten member companies received 2-million-man-hour safety achievement awards and 41 received 1-million-man-hour awards since the committee last met in October, 1960. In the calendar year 1960 there were 110 awards made to 47 companies, compared with 134 awards to 46 companies made in 1959. In addition, 66 companies achieved a reduction of 25 percent or more to the previous three-year average, and were awarded certificates for this accomplishment. E. C. Rue reported that the new frequency rate plaques are almost ready to be sent to the winners, and a brochure is to be developed describing the awards which are available.

J. R. Hanford spoke on the coming retirement of W. F. Moses, and I. R. Dohr spoke on the coming retirement of J. G. Dickinson, a longtime member of the committee.

Edwin Vennard, EEI Vice President and Managing Director, gave an illustrated lecture entitled "Your Part in Carrying Out the Industry and National Purpose." He said this material was being prepared in a form for use by the member companies and notice of its availability would be made to the EEI membership within the next month or so.

Hydraulic Power Committee Meeting

- *Fish Maintenance Facilities*
- *Report on Malpasset Dam*
- *California Water Bond Issue*

R. A. LANE
Chairman

APPROXIMATELY 40 members and guests convened at the Ridpath Hotel in Spokane, Wash., April 17-20, for the meeting of the Hydraulic Power Committee.

The meeting was devoted to the discussion of new developments in hydroelectric installations; review of industry standards concerning hydroelectric equipment; presentation of subcommittee reports; and round table discussions on the engineering, economic, and operation aspects of hydroelectric development.

A symposium on fish maintenance facilities was moderated by R. A. Lane, and had the following as panel members: R. E. Barrett, Holyoke Water Power Co.; G. J. Eicher, Portland General Electric Co.; and T. M. Vaughan, The Washington Water Power Co.

Mr. Barrett described the engineering and economic aspects of the fish transport system constructed by his company for shad and other species on the Connecticut River.

Mr. Eicher pointed out that fish conservation was a major part of the construction of hydroelectric projects in the western part of the United States, and advised that on some projects about 25 percent of the total cost could be assessed to fish facilities. The migratory fish found in the Connecticut River have habits which are quite different from those of the migratory fish in the Northwest.

Mr. Vaughan described the fish maintenance facilities provided by Washington Water Power. He said in several of their projects they were concerned with non-migratory types of fish, and provision of suitable spawning grounds was a satisfactory solution.

The various projects in the Columbia River Basin and the operation of the Northwest Power Pool were described by H. W. Harding of Washington Water Power.

C. R. Parrish reported that several companies in Pennsylvania had conducted tests on stream temperatures in their immediate areas. The surveys in the vicinity of the power stations indicate there is no distinct uniformity of temperature distribution in the receiving stream, as the mixing pattern varies between locations, and some variations were found for different surveys at the same location due to changes in river temperature, river flow, heat rejection, and dilution ratio.

On Monday afternoon the episodes which led to the failure of the Malpasset Dam in Frèjus, France, were described by H. K. Fairbanks of Ebasco Services, Inc. He stressed that the material was collected from various articles and that he personally had not had an opportunity to inspect the ruins of the Malpasset Dam.

The proposed Kinsua Dam Project in Pennsylvania was described by R. D. Ley of the General Public Utilities System. The High Mountain Sheep Project and the Snake River Development were reviewed by A. B. Martin of Washington Water Power.

The members and guests inspected the office facilities, system dispatcher's office, the service center, and the meter shop of Washington Water Power, located in suburban Spokane. All these facilities are in a coordinated group and incorporate the most recent design and construction principles.

Tuesday, April 18 was devoted to an escorted tour of the two newest and largest plants of Washington Water Power. Cabinet Gorge is located in the Clark Fork in Idaho and Noxon Rapids on the Clark Fork in Sanders County, Mont., approximate-

ly 45 miles southeast of Sandpoint, Idaho. Both plants are new and of modern design.

T. J. Corwin reviewed the major items in the recently approved $1.7 billion water bond issue in California. He said the magnitude of the plan was unprecedented in size, and will include an aqueduct which will be 700 miles long. This project will use more power than it develops and is primarily an irrigation project. Water will be sold to farmers at prices commensurate with location.

Construction is progressing satisfactorily on the Union Electric Co. Taum Sauk Pumped Storage Project, G. J. Vencill reported. It is anticipated that the operating cycle will consist of both units running all day for generation and all night for pumping, thus giving only one generating and one pumping start each day.

A subcommittee report on vibration in hydroelectric plants was presented by G. J. Vencill; on pressure regulation by T. J. Corwin; and on weather modification by J. H. Kime.

The greater portion of Tuesday afternoon was devoted to an informal round table discussion moderated by T. J. Corwin. Members, guests, and other interested parties present were invited to participate. A film describing modern methods of fuse plugging as developed by the Idaho Power Co., was shown by R. E. Gale. Under some circumstances considerable savings in construction costs can be effected by proper use of the fuse plugging technique. Idaho Power has conducted an elaborate study, including half-scale model tests.

The troubles experienced with gates, racks, and affiliated equipment were discussed at some length. It was generally agreed that the design of the rack depended on the stream trash content and the design of the plant. Use of removable racks, attached to permanently installed frames, was generally favored.

The design and operation of sluice and draft tube gates were also discussed. Turbine vibration under certain conditions of loading, and possible remedies were explained by various members and manufacturers. Turbine vibration is a major worry in an automatic plant because unless special instrumentation is installed it is difficult to detect. Remedies consist of introduction of air, change in loading, and minor changes in design and construction. F. E. Jaski said the vibration could be caused by bucket design, run-out, thrust bearings, or hydraulic thrust. He pointed out that bucket vibration could occur at various speeds due to design of buckets. In each design there is an optimum shape and thickness for the trailing edge of the bucket.

'Bare-Hand' Technique

(Continued from page 268)

the fiberglass reinforced plastic baskets, requiring no "down-time" of the aerial device itself for making tests and repairs as was required when the baskets themselves were the "insulation."

For transmission lines which cannot be taken out of service for maintenance and repairs, the bare-hand technique is an acceptable method of doing this work provided that the boom of the aerial basket device being used has satisfactorily passed an a-c hi pot test of sufficient magnitude to insure its safety. However, the use of such a technique on distribution voltages where another phase or ground wire is within reaching distance of the lineman when he is working one phase hot presents an entirely different problem.

We know what would happen if the lineman should forget to disconnect the metal platform on which he is standing before he reaches over to work on the next phase wire. Nor is it difficult to picture what would happen in the case of a two-basket unit where one man is connected to "A" phase and the other to "C" phase, and one lineman asks the other lineman to hand him a wrench or piece of material.

We hope that electric utility companies now using or contemplating using aerial basket devices for hot-line work will give this problem their most careful consideration when establishing working rules and safety regulations.

R. B. Gear

R. B. GEAR, Director of Purchases, Commonwealth Edison Co., and Chairman of the EEI Purchasing and Stores Committee for the 1960-61 administrative year, died in Chicago, June 15, two days after having undergone surgery. He was 56.

Mr. Gear, a 1928 graduate of Cornell University with a degree in electrical engineering, joined Commonwealth Edison that same year. He served the company in various engineering and administrative capacities.

When the Nuclear Power Study Group was formed in 1951, he became technical director, and later manager of the group. He had served as director of the Illinois Engineering Council, and was a past chairman of the Chicago Section, American Institute of Electrical Engineers.

W. G. Kelley

W. G. KELLEY, former assistant chief electrical engineer for Commonwealth Edison Co., and editor-in-chief of the 1927 edition of NELA's *Overhead Systems Reference Book*, died June 23 in Santa Barbara, Calif. He was 82.

Mr. Kelley retired in 1948 after more than 46 years in service with Commonwealth Edison.

A 1901 graduate of the Massachusetts Institute of Technology, Mr. Kelley joined the Chicago electric utility company soon afterwards.

Purchasing Practices Reviewed

(Continued from page 274)

the highest number of standards in this major area. Of the items identified in the questionnaire, measurement of items purchased per buying man-hour is the least in use. Additional items not mentioned in the questionnaire, but measured, are orders issued, change orders issued, requisitions received, and percentage of total purchases under $100.

In the area of cost and expense, 55 percent of the replies mention measurement of labor dollars. Only 43 percent of those (the 55 percent) have a standard in this area, although this may be the budget established for their element. To a slightly lesser degree, the answers show measurements being made for other-than-labor expenses of purchasing, and of trends of prices paid both in general and for selected items of purchase. Standards have been established by five companies for trends of prices paid on selected items. Quality of a purchasing operation is more difficult to measure, and this is apparently substantiated by results of the questionnaire. Vendor relations is receiving the greatest attention but is being measured by only 31 percent of the companies. All of the other items the committee identified—work measurement effectiveness ratings, both for buyers and clerical help, on-time deliveries, open orders overdue, availability of written procedures, and rejected material—are securing attention from 20 percent to 25 percent of the companies. Each of the items has a standard established by at least one company, with the two items with the greatest number of respondents having standards being those of availability of written procedures and of effectiveness rating for clerical help.

The planning activity of an element is also apparently difficult to measure. The fewest number of companies report measurements in this area, but conversely the greatest percentage of companies having measurements report having standards established. Sixty percent to 75 percent of those having measurements of items in this area have standards for those items. A maximum of 24 percent of the companies are reviewing quantity of planning, with 13 percent determining the percentage of their plans culminating in successful action.

How do the Purchasing elements analyze their relations with other departments in their respective companies? No one has developed a sound means for measuring this relationship, although most of us recognize a good interdepartmental relationship to be of value. About the only means of analyzing mentioned in the replies to the committee's question were the act of purchasing managers conferring on this subject with managers of other departments and, through observation, appraising the extent of cooperation between departments. The last two questions in the questionnaire on this topic were concerned with other controls used by the reporting companies, and in the establishment of use of reporting forms. The answers to the question of other controls varied in detail, but all dealt basically with general observation of element personnel during daily contact by the manager of the element. Similarly varied answers were received concerning the forms used in reporting, with the forms dealing generally with some phase of reporting on commitments. It is recognized that performance appraisal has long been a major challenge to Purchasing elements and to Purchasing organizations, such as the National Association of Purchasing Agents. Any advance in this area will be a major step toward achieving a long-term goal. Any improvement in measuring and appraising should lead to more effective control.

Community Leadership Urged at P&S Meeting

(Continued from page 271)

same time have essential records available for such things as an anti-trust investigation?

- Area Development—In our section, not as developed industrially as some others, we regard good relationship with our better located suppliers as highly important, and this yields dividends in load growth, service, costs and otherwise.
- Service and Cooperation—The development of mutual respect, service, and cooperation in material supplies is beneficial in inventory savings, job progress, and in other respects.
- Departmental Relationships—Purchasing and materials management are highly coordinated functions. Good relationships with other departments make for economies and smoother operation.
- Legal Aspects—Progressively, there are more complicated situations. General knowledge of contractual procedures and legal liaison are important.
- Public Relations—Purchasing and materials management represent the very front door of establishing and maintaining good public relations and the job is difficult.

People in Power

J. B. THOMAS

BEEMAN FISHER

J. B. THOMAS, President of Texas Electric Service Co., has been elected Chairman of the Board of the Fort Worth company. BEEMAN FISHER, Executive Vice President, was elected President, General Manager, and chief executive officer.

A graduate of Texas A&M College in 1911 with a mechanical engineering degree, Mr. Thomas began his electric utility career with Texas Power and Light Co. in 1912. He joined the affiliated Texas Electric Service in 1930 as vice president in charge of operations. He was elected president in 1941.

A dedicated leader in the industry for many years, Mr. Thomas has served as a member of the EEI Board of Directors, a member of its Advisory Committee, and currently is on its Executive Committee.

This year Mr. Thomas was awarded the Fort Worth Exchange Club's Golden Deed Award as "Man of the Year." This was the latest of a series of honors which he has received over the years for his achievements not only in the electric industry, but for his interest in advancing the cause of better government, for his Gruen Plan to revitalize the business of Fort Worth, and many other civic interests.

Mr. Fisher has been with the utility since 1938, when he joined the company as assistant to the president. Before that time he was for 16 years associated with Texas Power and Light Co. Mr. Fisher was elected a vice president of Texas Electric Service in 1949, and became a director in 1957. Last year he was promoted to executive vice president.

Among his various activities is the Texas Research League, of which he is a director and a member of the Executive Committee. He also has been active in EEI and other industry associations and professional groups.

MAX MCGRAW

JUDSON LARGE

Southern Colorado Power Co. has merged with Central Electric & Gas Co. The combined utility, with headquarters at Lincoln, Neb., has been renamed Western Power & Gas Co.

MAX MCGRAW was elected Chairman of the Board of the new corporation, and JUDSON LARGE was elected President.

Mr. McGraw founded the McGraw Electric Co., which in 1957 merged with Thomas A. Edison, Inc. Mr. McGraw is also chairman of McGraw-Edison Co.

He attended business college in Sioux City, Iowa, and in 1926 established an electric light plant in South Dakota. From this small start has grown the present Western Power & Gas Co.

Mr. Large had been President of Central Electric & Gas since 1949.

He attended Morningside College in Sioux City; Dartmouth College; and the University of Iowa. From 1928 to 1956 he was secretary-treasurer of McGraw-Edison. Since that year he has been vice president and secretary of McGraw-Edison.

D. H. MITCHELL

D. H. MITCHELL, President of Northern Indiana Public Service Co. for 23 years, has been elected Chairman, President, and chief executive officer of the company. C. D. REES, Vice President, General Operations, was elected First Vice President.

Mr. Mitchell has been in the utility field more than 36 years. He attended the University of Chicago, majoring

in economics, and studied law at Northwestern University. He served in the Navy during World War I, and joined Calumet Gas and Electric Co. after the war. This company later became a part of NIPS. In 1924, he was appointed assistant auditor, and later served as auditor, controller, general manager, vice president, and since 1938 had been president.

E. G. TWOHEY, former President of Lawrence Gas Co., was elected President of the Merrimack-Essex Electric Co., a subsidiary of New England Electric System. He succeeds E. C. BOWER, who has been elected President of The Narragansett Electric Co., also in NEES.

Mr. Twohey has been associated with New England Electric companies since 1925. He is a graduate of Norwich University with a degree in electrical engineering. He joined New England Electric at Lowell in 1925 as a student engineer, and since then has held supervisory and executive positions in several New England Electric subsidiaries.

In his new assignment he returns to the northeastern area where he was at one time in charge of sales for the Lawrence Gas and Electric Co.

Mr. Bower rose from student engineer through various supervisory and executive positions in several New England Electric subsidiaries.

He was graduated from Vermont Academy and Norwich University with a degree in engineering.

J. L. MCNEALEY has been named Executive Vice President of Columbus and Southern Ohio Electric Co. He had been Vice President, Operations.

F. H. STREIT, Production Department Manager of the company since 1954, was elected Vice President, Electrical Operations. ARTHUR GREEN, Controller since 1950, was elected Vice President-Controller.

A. N. ANDERSON and W. C. BEATTIE, Assistant Vice Presidents of Consolidated Edison Co. of New York, Inc., have been promoted to Vice Presidents of the company.

Mr. Anderson will be responsible for construction activity in the streets, and for transportation throughout the company's service area, except Staten Island. Mr. Beattie will be responsible for electric, gas, and steam production facilities.

F. A. GOING, who has been with Consolidated Edison since 1922, was elected Auditor.

E. G. TWOHEY

E. C. BOWER

H. R. JOHNSON, who has directed the public relations and advertising activities of the American Electric Power Co. system for the past nine years, has been named a Vice President of American Electric Power Service Corp.

Mr. Johnson, a member of the EEI Public Relations Committee, was previously director of the public relations department of Ohio Power Co., a major operating company of the AEP system. He founded that department at Ohio Power.

R. E. WALKER, Systems and Procedures Department Manager, The Cleveland Electric Illuminating Co., recently was elected Vice President-General Services of the utility, succeeding A. J. PAULL, who resigned because of ill health. Mr. Walker joined the company last year. S. E. WERTHEIM succeeds Mr. Walker as Systems and Procedures Department Manager.

J. E. STODDART, General Sales Manager, Northern States Power Co., has been elected Vice President in Charge of Marketing of the utility.

He will be in charge of commercial, industrial, and residential sales of electricity and gas, as well as merchandise sales activities, and the home service department. Mr. Stoddart joined Northern States Power 27 years ago. He started his career in the merchandise sales department.

C. J. SINNOTT, General Sales Manager of New Orleans Public Service Corp., has been elected Vice President of the company.

Mr. Sinnott joined New Orleans Public Service in 1937 as a commercial sales representative in the general sales department. He has been general sales manager since 1958. He also has been a member of the EEI Sales Division Executive Committee.

J. R. MCCORMICK, Public Relations Director of The Hartford Electric Light Co., has been elected Vice President of the company.

Mr. McCormick joined Hartford Electric Light in 1935, following graduation from the University of Connecticut. He began his career in the accounting department and later joined the sales department, where he remained until 1952, when he became public relations assistant. He was appointed public relations director in 1958.

J. J. POWELL, General Sales Manager of Mississippi Power & Light Co., and one of the founders of the company's sales department in 1926, has been named Vice President of the company. At Mississippi Power & Light he has been a division sales manager, sales promotion and advertising manager, and residential sales manager.

L. M. SHADGETT, Vice President and Athens Division Manager of Georgia Power Co., has been named Vice President and Assistant General Manager of the company. B. W. BURTON, Athens Division Superintendent, succeeds Mr. Shadgett as Vice President and Athens Division Manager. A native of Adelaide, South Australia, Mr. Shadgett is a graduate of the School of Mines of the University of Adelaide. He began his career with Alabama Power in 1924, and joined Georgia Power in 1928. He has been a vice president since 1940.

He has served as chairman of the Georgia section of the American Institute of Electrical Engineers and of the EEI Accident Prevention Committee. Mr. Burton holds a degree in electrical engineering from Georgia Tech. Following pre-college and summer vacation work with the company, he joined Georgia Power permanently as a field engineer in Atlanta in 1937.

F. E. LUCKING, Commercial Manager of California Electric Power Co., has been elected Commercial Vice President of the utility.

In his new position, Mr. Lucking will be responsible for the company's sales, customer services, and public relations activities. Mr. Lucking has been with the company since 1924.

R. W. STEELE, Assistant to the President, and OSCAR SOLBERG, Secretary and Treasurer, Interstate Power Co., have been elected Vice Presidents of the company.

Mr. Steele joined Interstate Power in 1941. After serving in the Navy during World War II, he returned as resident engineer. He was named staff assistant in 1954, and became assistant to the president in 1957.

Mr. Solberg has been with the company since 1921, when he joined Interstate Power's predecessor company. He became secretary and treasurer in 1938.

B. S. JEFFREY, President of The Kansas Power and Light Co., received The University of Kansas Citation for Distinguished Service, the highest honor given by K. U. It is awarded jointly by the university and its alumni association.

The formal citation ceremony was held in conjunction with the K. U. commencement exercises in June.

Prime Movers Committee Meeting

(Continued from page 285)

of the Engineering Foundation, as recommended by the committee.

During consideration of research of interest to power station design and operating engineers, the committee reviewed and endorsed the recommendation of its executive group that the EEI not participate in several project proposals that were felt to be of somewhat limited potential or not feasible for Institute sponsorship.

The Prime Movers Committee noted with regret that C. A. Dauber, the committee's Vice Chairman during the past two years, is discontinuing his affiliation with The Cleveland Electric Illuminating Co., and therefore will not be available to assume the chairmanship of the committee during the coming administrative year. R. A. Baker, Public Service Electric and Gas Co., has accepted this assignment.

A feature of the session of the third day was a motion picture produced by Westinghouse Electric Corp. entitled "Reducing Thermal Stresses." This picture was concerned with cracked turbine casings.

Fatal Accidents in 1961

(Continued from page 279)

rubber gloves, climbing into an energized area, or drilling into a live cable with a grounded drill.

Item of Protective Equipment Required but Omitted or Incorrectly Used	Number of Times Shown on the 79 Reports
Rubber Gloves	25
Rubber Sleeves	5
Rubber Blankets	15
Line Hose	22
Insulator Hoods	11
Ropes or Barriers	4
Portable Grounds	9
Safety Hats	8
Miscellaneous	3
Not Reported	4
Total	106

It is the hope of the Accident Prevention Committee, which compiles these facts, that this report will be widely circulated and that Table II will show ever-decreasing figures for each future year.

EDISON ELECTRIC INSTITUTE OFFICERS AND COMMITTEES

OFFICERS

PHILIP A. FLEGER, President
Duquesne Light Co.
Pittsburgh, Pa.

W. W. LYNCH, Vice President
Texas Power & Light Co.
Dallas, Texas

EDWIN VENNARD, Vice President and Managing Director
750 Third Ave.
New York, N. Y.

H. S. SUTTON, Treasurer
Consolidated Edison Co. of New York, Inc.
New York, N. Y.

A. B. MORGAN, Secretary and Assistant Managing Director
750 Third Ave.
New York, N. Y.

BOARD OF DIRECTORS

(Terms expiring 1962)

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Central Hudson Gas & Electric Corp.

W. L. CISLER
The Detroit Edison Co.

J. E. CORETTE
The Montana Power Co.

G. W. EVANS
Kansas Gas and Electric Co.

O. T. FITZWATER
Indianapolis Power & Light Co.

R. A. GIBSON
The Hartford Electric Light Co.

R. E. GINNA
Rochester Gas and Electric Corp.

E. L. LINDSETH
The Cleveland Electric Illuminating Co.

J. W. McAFEE
Union Electric Co.

H. M. MILLER
Columbus and Southern Ohio Electric Co.

E. M. NAUGHTON
Utah Power & Light Co.

J. L. RICE, JR.
Allegheny Power System, Inc.

W. R. SNYDER
Metropolitan Edison Co.

H. P. TAYLOR
Wisconsin Public Service Corp.

D. J. TUEPKER
Public Service Co. of Oklahoma

(Terms expiring 1963)

C. F. AVILA
Boston Edison Co.

HARLLEE BRANCH, JR.
The Southern Co.

H. J. CADWELL
Western Massachusetts Electric Co.

R. H. FITE
Florida Power & Light Co.

J. K. HORTON
Southern California Edison Co.

A. S. KING
Northern States Power Co.

M. S. LUTHRINGER
Central Illinois Public Service Co.

P. B. McKEE
Pacific Power & Light Co.

D. H. MITCHELL
Northern Indiana Public Service Co.

R. G. RINCLIFFE
Philadelphia Electric Co.

W. H. SAMMIS
Ohio Edison Co.

W. O. TURNER
Louisiana Power & Light Co.

J. H. WARD
Commonwealth Edison Co.

T. H. WHARTON
Houston Lighting & Power Co.

E. H. WILL
Virginia Electric and Power Co.

(Terms expiring 1964)

J. M. BELL, JR.
New York State Electric & Gas Corp.

WALTER BOULDIN
Alabama Power Co.

P. O. CANADAY
Arkansas Power & Light Co.

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